THE DURABILITY OF GLASS IONOMER SEALANTS COMPARED TO RESIN-BASED SEALANTS ON MIH PERMANENT MOLARS – A PILOT STUDY

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ABSTRACT

Introduction: The molar-incisor-hypomineralization (MIH) is defined as the hypomineralization of systemic origin of one to four permanent first molars. It is frequently associated with affected incisors. These MIH molars are related to dental caries and other severe problems. Dental pit and fissure sealants are used to prevent dental caries in the permanent teeth. Pit and fissure sealants may also be useful to treat permanent molars with MIH when teeth have fully erupted and when moisture control is adequate. The retention rate of the sealants will affect this preventive treatment of MIH permanent molars.

Purpose: This study aims to compare the retention rates between glass ionomer sealants and resin-based sealants on molar incisors MIH permanent molars.

Methods: This is a randomized controlled clinical trial study. 10 patients with 26 permanent first molars at least one of them has MIH will be recruited from Jamaica Hospital Medical Center (JHMC) dental clinic.

Results: 2 out of 10 patients with 6 MIH teeth who had no follow-up visit will be excluded from the study. All eight patients were ASA type I healthy patients who visit JHMC from 07/2020 to 01/2022. Most patients brush their teeth 2x daily except one patient at a 1-month recall visit who brushed her teeth 3 times daily and at a 6-month recall visit, she only brushed her teeth 1times daily. Only 2 patients had 6 months recall visits. Of 22 MIH molars, 68.2% (15/22) had MIH index 1; 27.3% (6/22) had MIH index 2a; and 4.5% (1/22) had MIH index 2b. 45.5% (10/22) were treated with Glass Ionomer (GI) sealants and 54.5% (12/22) were treated with resin-based sealants. Only one tooth failed according to the Modified Simonsen's Criteria which had MIH index 2a. The descriptive data shows that there is no difference between GI sealants and resin-based sealants.

BACKGROUND AND SIGNIFICANCE

Molar-incisor hypomineralisation (MIH) was first introduced by Weerheijm et al[1] in 2001 and the clinical presentations include non-fluoride enamel opacities, internal enamel hypoplasia, non-endemic mottling of enamel, idiopathic enamel opacities and cheese molars.[2] Weerheijm et al further described that MIH teeth were more susceptible to getting dental caries than non-affected teeth possibly due to their enamel porosity which can lead to enamel fracture.[6]

Preventative treatment for MIH includes pit and fissure sealants.[4] The advantages of dental sealants include non-invasiveness, ease of replacement, and the ability to be regularly monitored.[7] However, poor retention rates of the sealants on MIH teeth cast doubts about this prevention treatment.[4] More studies need to be done to explore the longevity of sealants in treating MIH-affected teeth. A recent long-term clinical study has shown that higher retention rates could be achieved if a 5th generation bonding adhesive is applied before pit and fissure sealants application.[8] Besides traditional resin-based sealants, GI can be another sealant material. The property of true bonding to the tooth might be able to get a better retention rate.

This study is designed to compare the retention rate between resin-based and GI sealants on MIH molars. This study also will compare the retention rates between MIH and normal teeth using resin-based sealants.

Hypothesis

The retention rate of GI sealants is higher compared to resin-based sealants on MIH permanent molars.

The retention rate of resin-based sealants on normal permanent molars is higher compared to the MIH permanent molars

METHODS

This is a randomized controlled clinical trial study. 30 patients with up to 4 permanent first molars which at least one of them has MIH will be recruited from Jamaica Hospital Medical Center (JHMC) dental clinic.

Inclusion criteria

Patients between the age of 5 and 21 or permanent first molar fully erupted.

Patients have at least one MIH permanent molars by definition (the defect larger than 1 mm4) on the occlusal and/or buccal surfaces

Patients are ASA type I or II

Exclusion criteria

Excessive bruxing

Teeth were cavitated and required restoration treatment

Previously treated with restorations.

After consent, preoperative intraoral photos will be taken to assess the severity of the MIH. Patients' teeth will be randomized by 0 (GI) and 1 (resin) for corresponding treatment. If a patient has more than one tooth, the order of upper right (UR), upper left (UL), lower left (LL), and lower right (LR) will be used to randomize teeth. For example, if a patient has UR and UL, the UR will be randomized to 0 or 1, then the other treatment option will be used in UL. If a patient has UL, LL, and LR, both UL and LL will be randomized. If both 0 or both 1 happened, the remaining tooth will use the other treatment. If a 0 and a 1 happened, the remaining tooth will be randomized again.

Data records

The following variables will be collected:

Patients' gender, age, ethnicity, how many times brushing daily, and MIH index[11]. MIH index was 0 indicating that the tooth is normal.

Failure of dental sealants
Use Modified Simonsen's Criteria[9] will be used to determine the failure of dental sealants Scores 0 and 1 will be determined as success.

Scores 2, 3, and 4 will be determined as failures.

Safety data will be collected including allergic, toxicity, and mortality to the materials used in the study

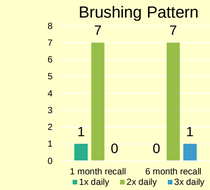
MIH Index[2]

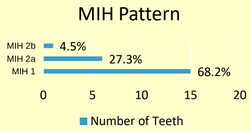
Index	Definition
0	No MIH, clinically free of MIH
1	MIH without hypersensitivity, without defect
2	MIH without hypersensitivity, with defect
2a	<1/3 defect extension
2b	>1/3 <2/3 defect extension
2c	>2/3 defect extension or/and defect close to the pulp or extraction or atypical restoration
3	MIH with hypersensitivity, without defect
4	MIH with hypersensitivity, with defect
4a	<1/3 defect extension
4b	>1/3 <2/3 defect extension
4c	>2/3 defect extension or/and defect close to the pulp or extraction or atypical restoration

Modified Simonsen's Criteria[4]

Score	Meaning
Score 0	No loss of sealant and no evidence of caries
Score 1	Partial loss of sealant and no evidence of caries
Score 2	Partial loss of sealant and evidence of caries
Score 3	Complete loss of sealant and no evidence of caries
Score 4	Complete loss of sealant and evidence of caries

RESULTS





Ten patients with 28 MIH molars were recruited for the study. Two out of ten patients with 6 MIH teeth who had no follow-up visit will be excluded from the study. All eight patients were aged from 9 to 11 with a mean age of 10.375. All patients were ASA type I healthy patients who visit JHMC from 07/2020 to 01/2022. Most patients brush their teeth 2x daily except one patient at a 1-month recall visit who brushed her teeth 3 times daily and at a 6-month recall visit, she only brushed her teeth 1times daily. Only 2 patients had 6 months recall visits.

There are 15 teeth with MIH 1 (MIH without hypersensitivity, without defect), 6 teeth with MIH 2a (MIH without hypersensitivity, with defect, <1/3 defect extension), and 1 tooth with MIH 2b (MIH without hypersensitivity, with defect, >1/3 <2/3 defect extension)

Of 22 MIH molars, 68.2% (15/22) had MIH index 1; 27.3% (6/22) had MIH index 2a; and 4.5% (1/22) had MIH index 2b. 45.5% (10/22) were treated with Glass Ionomer (GI) sealants and 54.5% (12/22) were treated with resin-based sealants. Only one tooth failed according to the Modified Simonsen's Criteria which had MIH index 2a.

At 1 month follow up

	GI sealants (N=10)	Resin-based sealants (N=12)
MIH 1	5	10
MIH 2a	4	2
MIH 2b	1	0

At 6 month follow up

	GI sealants (N=2)	Resin-based sealants (N=4)
MIH 1	0	4
MIH 2a	1	0
MIH 2b	1	0

At 1 month follow up

Score	GI sealants (N = 10)	Resin-based sealants (N = 12)
Score 0	7	8
Score 1	3	3
Score 2	0	1
Score 3	0	0
Score 4	0	0

At 6 month follow up

Score	GI sealants (N = 3)	Resin-based sealants (N=4)
Score 0	0	1
Score 1	3	3
Score 2	0	0
Score 3	0	0
Score 4	0	0

	GI sealants	Resin-based sealants
Success	10	12
Failure	0	1

	GI sealants	Resin-based sealants
Success	3	4
Failure	0	0

DISCUSSION

For regular teeth, resin-based sealants will have better retention but GI sealants will work with a comprised oral condition like not fully erupted- teeth. The most updated AAPD guideline about pit and fissure sealants was unable to determine the superiority of 1 type of sealant over another owing to not enough study. For MIH teeth, GI fluoride-releasing characteristics will be a bonus for strengthening the teeth. However, whether it works better compare to resin-based sealants is still questionable. Further studies will be needed.

CONCLUSIONS

Due to the small sample size, data is not powerful enough to be statistically meaningful. More data will be needed to determine the durability.

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