

# Is there a best conventional material for restoring posterior primary teeth? A network meta-analysis

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**Abstract:** This study aimed to compare the longevity of different conventional restorative materials placed in posterior primary teeth. This systematic review was conducted following the PRISMA statement and registered in PROSPERO (CRD42016035775). A comprehensive electronic search without date or language restrictions was performed in PubMed/MEDLINE, Cochrane Central Register of Controlled Trials, Scopus, Turning Research Into Practice (TRIP) and Clinical Trials databases up to January 2017, selecting randomized clinical trials that assessed the longevity of at least two different conventional restorative materials performed in primary molars. Seventeen studies were included in this systematic review. Pairwise and network meta-analyses were performed and relative risks and 95% confidence intervals (CI) calculated. Two reviewers independently selected the studies, extracted the data, and assessed the risk of bias. Restorations of primary molars with conventional glass ionomer cement showed increased risk of failure than compomer, resin-modified glass ionomer cement, amalgam, and composite resin. Risk of bias was low in most studies (45.38% of all items across studies). Pediatric dentists should avoid conventional glass ionomer cement for restoring primary molars.

**Keywords:** Dental Materials; Evidence-Based Dentistry; Pediatric Dentistry.

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## Introduction

Although the prevalence of dental caries has decreased, advanced caries lesions remain a frequent problem that can negatively impact the quality of life of children.<sup>1</sup> Therefore, dental fillings are still routinely placed in daily pediatric dental clinics. Restorative therapy has many benefits such as restoring the tooth structure and, thus, preventing teeth from shifting and protecting the dental pulp.<sup>2</sup>

Conventional restorative materials available for restoring posterior primary teeth include amalgam (AM), conventional glass ionomer cement (GIC), resin-modified glass ionomer cement (RMGIC), high-viscosity glass ionomer cement (HVGIC), compomer (CP), and composite resin (CR).<sup>3</sup> Although amalgam has been considered the gold standard in restorative dentistry<sup>4</sup>, its use has decreased mainly because of the potential toxicity of mercury and the need to remove healthy tooth structure during preparation.<sup>5</sup> Therefore, restorative materials with adhesive properties





of searches of various databases were cross-checked to locate and eliminate duplicates using Review Manager Software 5.1 (Nordic Cochrane Centre, Cochrane Collaboration).

### Selection criteria

Titles and abstracts were reviewed independently by two authors (CWP and DP) and selected for further review if they met the inclusion criteria: clinical trials that compared the longevity of at least two different conventional restorative materials placed in posterior primary teeth. Any disagreement was firstly solved by discussion between the two reviewers. If disagreements remained, a third author (TLL) was consulted. The inter-examiner agreement was calculated (Kappa = 0.96), indicating excellent agreement. To retrieve all relevant articles, the reviewers screened the reference lists of the included articles.

A final decision about inclusion was made based on the full-text of the potentially relevant studies in accordance with the exclusion criteria: non-random allocation of subjects; follow-up of less than 12 months; dropout higher than 30%; absence of similar follow-up for groups evaluated in a similar way; no computable data for both groups; did not perform conventional treatment – such as Atraumatic Restorative Treatment (ART), comparison of conventional filling material with any type of preformed crowns, and sample containing teeth that received endodontic treatment prior to the restorative treatment.

### Data extraction

The selected full-text articles were assessed (CWP and DP) using a standardized form (Office Excel 2013 Software, Microsoft Corporation, Redmond, WA, USA) and the relevant data were extracted independently. From each study, the following data were recorded: demographic setting (year, country), study design, type of cavity, characteristics and size of the population, age range of participants, number of teeth/restorations, follow-up period, evaluation intervals, dropout rate, commercial brand and manufacturer of the materials, operative field isolation method, number of operators and evaluation criteria. The longevity of the materials was recorded as the number of failed restorations.

### Risk of bias assessment

The two reviewers independently assessed (Kappa = 1.00) the risk of bias using the assessment forms specific for each study design.<sup>9</sup> The criteria were divided into seven domains as follows: selection bias (sequence generation, allocation concealment), performance and detection bias (blinding of participants, personnel, and outcome assessment), attrition bias (incomplete outcome data), and reporting bias (selective outcome reporting). The evaluation of the studies was performed by rating each of the study criteria as “low risk”, “high risk”, or “unclear risk” (no information or uncertainty over the potential for bias). If needed, authors were contacted via e-mail (at least two attempts were made) for missing or unclear information.

### Statistical analysis

The data were analyzed using traditional pairwise meta-analysis followed by network meta-analysis.<sup>10</sup> The network meta-analysis was based on a binomial model with log link function.<sup>11</sup> Therefore, the effect-size measure estimated was relative risk.<sup>9</sup> The GIC was considered the baseline treatment. Both fixed effect and homogeneous variance random effects models were considered. The choice of model and goodness of fit was made based on the DIC (Deviance Information Criterion). Models were adjusted using Markov Chain Monte Carlo methods with non-informative priors. Convergence was assessed by trace plots and inconsistency by split node method.<sup>12</sup>

## Results

### Study selection

The search strategy identified 1,561 potentially relevant records, excluding duplicates. Two ongoing trials were identified. After screening titles and abstracts, 48 studies were retrieved to obtain detailed information. Another 10 studies were identified in reference lists of related reviews. From the 58 full-text articles, 2 studies presented the same sample<sup>13,14</sup> and, thus, the one with shorter follow-up period was excluded.<sup>13</sup> Finally, 17 randomized controlled trials (RCTs) met the eligibility criteria and were included in the systematic review. The flow chart in Figure 1 summarizes the process of study selection and the reasons for exclusions.

## Characteristics of the included studies

The main characteristics of the included papers are presented in the Table 1. There were six RCTs using parallel groups,<sup>15,16,17,18,19,20</sup> one RCT<sup>21</sup> using split-mouth design in most samples and ten RCTs using split-mouth for all samples.<sup>14,22,23,24,25,26,27,28,29,30</sup> The follow-up period ranged from 12 to 60 months; however, 47.06% of the studies had 24 months of follow-up. Only two studies used FDI as evaluation criteria.<sup>15,30</sup>

Of the total studies, 41.2% evaluated Class I and II restorations in primary teeth<sup>14,16,20,23,25,26,29</sup> and 47.06% used rubber dam isolation.<sup>14,15,16,17,20,22,23,29,30</sup> Three clinical studies compared AM and CR,<sup>22,23,24</sup> AM and CP,<sup>17,27,28</sup> or RMGIC, CP and CR restorations<sup>14,15,30</sup>. CR and RMGIC,<sup>19,20</sup> or CP and CR<sup>16,29</sup> were investigated by two different studies. There was only one article that compared restorations performed with GIC and RMGIC,<sup>21</sup> AM and GIC,<sup>25</sup> AM and RMGIC,<sup>18</sup> and CP

and GIC.<sup>26</sup> Moreover, some studies did not report the commercial brand of the adhesive used.

## Risk of bias

The final assessment of the risk of bias for the included studies is displayed in Table 2. Risk of bias was low in most studies (45.38% of all items across studies). Six studies did not describe the method used to generate the random sequence,<sup>17-19,23-25</sup> leading to unclear risk of bias in this domain. Moreover, all studies had unclear risk of bias regarding the allocation concealment. Only studies comparing AM with tooth-colored conventional fillings had high risk of bias in blinding of participants domain.<sup>17,18,2,23,24,25,27,28</sup> All studies were classified as high risk considering blinding of operators and evaluators, since their blinding is not possible when performing and evaluating dental restorations.

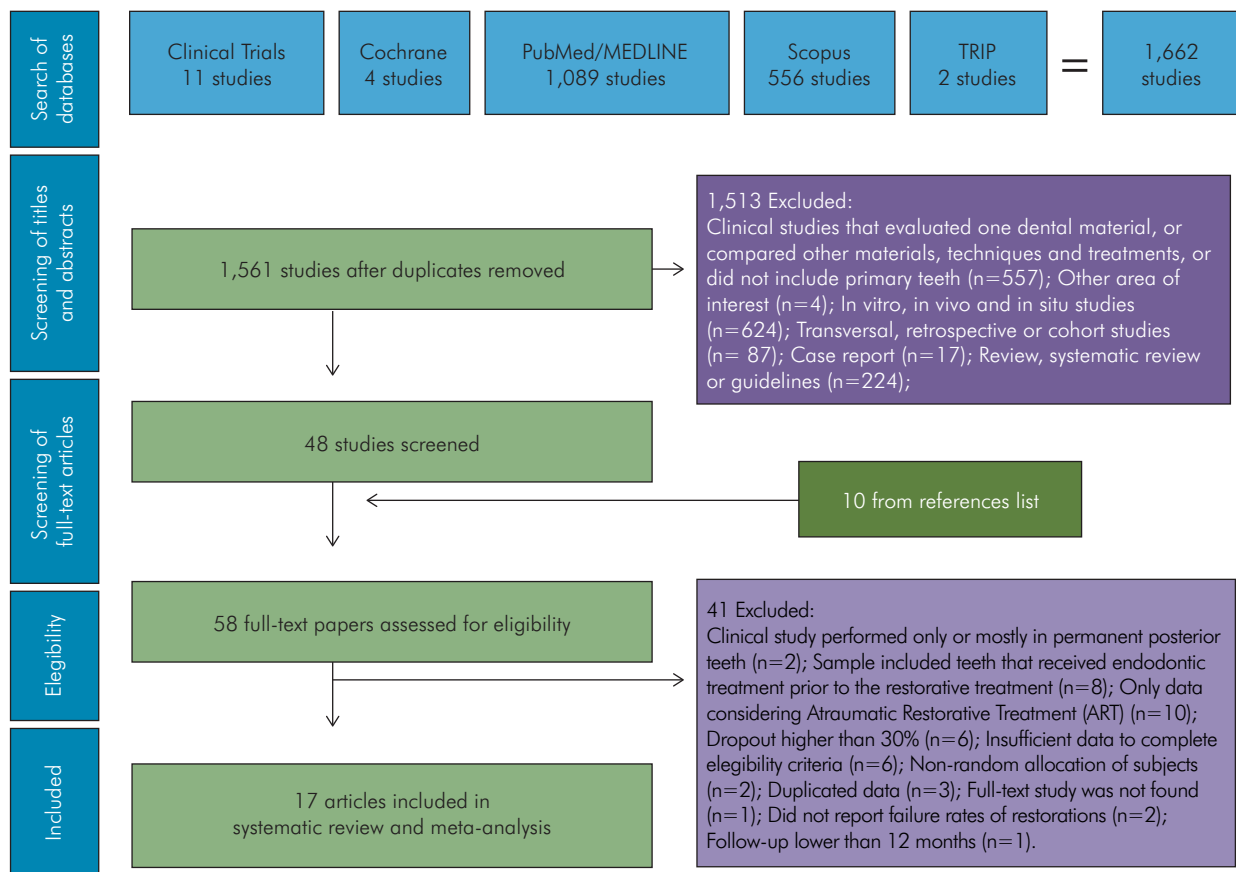


Figure 1. PRISMA flow diagram outlining the study selection process.

**Table 1.** Main data from included studies in the Systematic Review.

Author	Country	Study design	Type of cavity	Population: Children (age-range in years)	N° teeth	Follow-up/Evaluation times (months)	Dropout (%)	Manufacturers and country	Number of operators	Field isolation	Failed restorations/total of restorations	Criteria
Tonn et al. (1980) <sup>22</sup>	United States	SM	CII	NR (3,2–8,9)	210	24/4	27.6	CR (Epoxydent, Lee Pharmaceutical Corp., South El Monte, CA, USA) AM (Optaloy, L.D. Caulk Co., Milford, DE, USA)	1	Abs	CR– 13/105 AM – 6/105	USPHS
Oldenburger et al. (1987) <sup>23</sup>	United States	SM	CI–II	41 (NR)	152	24/6	6	CR (Caulk H–120, L.D. Caulk Co., Milford, DE, USA) AM (Sybralloy, Kerr Manufacturing Co., Romulus, MI, USA)	NR	Abs	CR – 2/91 AM– 4/61	USPHS
Barr–Agholme et al. (1991) <sup>24</sup>	Sweden	SM	CII	43 (6.4)	119	24/12	13.9	CR (Scotchbond* + P30, 3M Co, St Paul, MN, USA) AM (Dispers alloy Lee Pharmaceutical Corp., South El Monte, CA, USA)	2	Rel	CR – 6/52 AM– 11/34	USPHS
Welbury et al. (1991) <sup>25</sup>	England	SM	CI–II	76 (7–8)	238	60/6	16.8	GIC (Ketac–Fil, ESPE GmbH, Seefeld, Oberbay, West Germany) AM (Amalcap, Vivadent, Schaan, Liechtenstein)	2	Rel	GIC –39/119 AM– 24/119	USPHS
Hse and Wei (1997) <sup>16</sup>	Japan	PG	CI–II	36 (4–7)	118	12/6	0	CR (Prisma Universal Bond 3* + Prisma TPH, L.D. Caulk Co., Dentsply, Milford, DE, USA) CP (Dyract, L.D. Caulk Co., Dentsply, Milford, DE, USA)	1	Abs	CR – 1/59 CP – 1/59	USPHS
Marks et al. (1999) <sup>17</sup>	Netherlands	PG	CII	52 (6.9)	114	12/6	22	CP (Dyract, L.D. Caulk Co., Dentsply, Milford, DE, USA) AM (Tytin, Kerr Manufacturing Co., Romulus, MI, USA)	3	Abs	CP – 9/53 AM – 4/61	USPHS
Welbury et al. (2000) <sup>26</sup>	England	SM	CI–II	29 (4–9)	112	42/6	10.7	CP (Prime and Bond 2.1* + Dyract, Dentsply De Trey, Konstanz, Germany) GIC (Chemfil Superior, Dentsply De Trey, Konstanz, Germany)	2	Rel	CP – 3/56 GIC – 12/56	USPHS
Dutta et al. (2001) <sup>18</sup>	India	PG	CII	120 (4–9)	480	12/4	18.7	RMGIC (Fuji–II LC, GC Corporation, Tokyo, Japan) AM (Solilia, NOVA, DPL, India)	1	NR	RMGIC–61/360 AM – 34/120	USPHS
Duggal et al. (2002) <sup>27</sup>	UK	SM	CII	78 (4–7)	156	24/6	23.1	CP (Dyract, Dentsply De Trey, Konstanz, Germany) AM (Contour, Kerr Manufacturing Co., Romulus, MI, USA)	3	Rel	CP – 22/78 AM – 26/78	USPHS

Continue

Continuation	Sweden	Majority SM	CII	40 (4-7)	115	36/6	1.7	RMGIC (Vitremer, 3M Co, St Paul, MN, USA) GIC (Fuji II, GC Europe N.V. Leuven, Belgium) CP (Clicker* + F2000, 3M ESPE, St Paul, MN, USA) AM (Dispers alloy, Dentsply De Trey, Konstanz, Germany)	1	Rel	RMGIC – 2/53 GIC – 11/62 CP – 1/75 AM – 1/75	USPHS
Hübel and Mejäre (2003) <sup>21</sup>	Sweden	SM	CII	40 (4-7)	115	36/6	1.7	RMGIC (Vitremer, 3M Co, St Paul, MN, USA) GIC (Fuji II, GC Europe N.V. Leuven, Belgium) CP (Clicker* + F2000, 3M ESPE, St Paul, MN, USA) AM (Dispers alloy, Dentsply De Trey, Konstanz, Germany)	1	Rel	RMGIC – 2/53 GIC – 11/62 CP – 1/75 AM – 1/75	USPHS
Kavvadia et al. (2004) <sup>28</sup>	Greece	SM	CII	75 (6-9)	150	24/6	24.1	CR (Excite* + Tetric Flow, Vivadent, Schaan, Liechtenstein) RMGIC (Vitremer, 3M ESPE, St Paul, MN, USA)	2	NR	CR – 9/66 RMGIC – 7/66	USPHS
Andersson-Wenckert and Sunnegårdh-Grönberg (2006) <sup>19</sup>	Sweden	PG	CII	57 (5-11)	132	24/12	24	CR (Excite* + Tetric Flow, Vivadent, Schaan, Liechtenstein) RMGIC (Vitremer, 3M ESPE, St Paul, MN, USA)	5	Rel	CR – 9/66 RMGIC – 7/66	USPHS
Pascon et al. (2006) <sup>29</sup>	Brazil	SM	CII	30 (4-9)	79	24/6	25	CR (Heliobond* + Heliomolar, Vivadent, Schaan, Liechtenstein) CP (Single Bond* + F2000, 3M ESPE, St Paul, MN, USA – AND – Prime and Bond NT* + Dyract, Dentsply De Trey, Konstanz, Germany)	2	Abs	CR – 5/27 CP – 14/52	USPHS
Alves dos Santos et al. (2010) <sup>14</sup>	Brazil	SM	CII	48 (3-9)	141	48/12	11.3	CR (Prime and Bond NT* + TPH Spectrum, Dentsply, Petropolis, Rio de Janeiro, Brazil) RMGIC (Vitremer, 3M ESPE, St Paul, MN, USA) CP (Stae* + Freedom, SD, Bayswater, Victoria, Australia)	2	Abs	CR – 11/44 RMGIC – 12/46 CP – 8/51	USPHS
Casagrande et al. (2013) <sup>20</sup>	Brazil	PG	CII	66 (5-9)	132	18/6	7.6	CR (Adper Single Bond 2* + Filtek Z350-AND – P90 System Adhesive* + Filtek P90, 3M ESPE, St Paul, MN, USA) RMGIC (Vitremer, 3M ESPE, St Paul, MN, USA)	NR	Abs	CR – 12/94 RMGIC – 5/38	USPHS
Sengul and Gurbuz (2015) <sup>15</sup>	Turkey	PG	CII	41 (5-7)	146	24/3	0	CR (Prime and Bond NT* (Dentsply De Trey, Konstanz, Germany) + Valux Plus, 3M ESPE, St Paul, MN, USA) RMGIC (Fuji II LC, GC Corporation Tokyo, Japan) CP (Prime and Bond NT* + Dyract AP, Dentsply De Trey, Konstanz, Germany)	1	Abs	CR – 9/40 RMGIC – 9/32 CP – 12/36	FDI
Bektas Donmez et al. (2016) <sup>30</sup>	Turkey	SM	CII	31 (4-7)	93	18/6	7.5	CR (XP BOND* + Esthet-X HD, Dentsply De Trey, Konstanz, Germany) RMGIC (Photac-Bond Quick, 3M ESPE, St Paul, MN, USA) CP (XP BOND* + Dyract eXtra, Dentsply De Trey, Konstanz, Germany)	1	Abs	CR – 4/31 RMGIC – 2/31 CP – 1/31	FDI

SM: split-mouth; PG: parallel group; CII: class II; CII-I: class I and II; NR: not reported; CR: composite resin; AM: amalgam, GIC: conventional glass ionomer cement; CP: compomer; RMGIC: resin-modified glass ionomer cement; Abs: absolute; Rel: relative. \*Adhesive system.

**Table 2.** Risk of bias of the included studies.

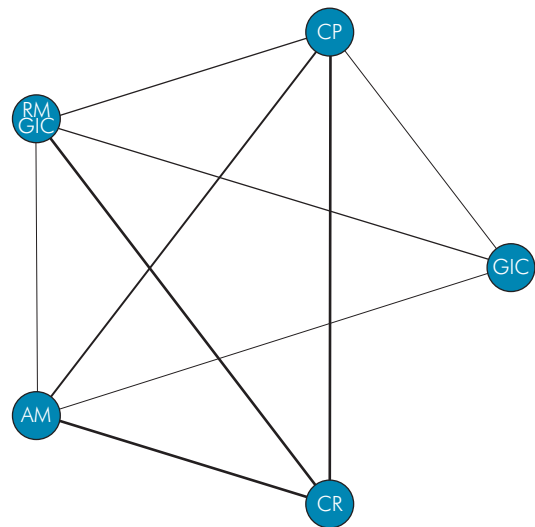
Author	Random sequence generation	Allocation concealment	Blinding of participants	Blinding of personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting
Tonn et al. (1980) <sup>22</sup>	low	unclear	high	high	high	low	low
Oldenburg et al. (1987) <sup>23</sup>	unclear	unclear	high	high	high	low	low
Barr-Agholme et al. (1991) <sup>24</sup>	unclear	unclear	high	high	high	low	low
Welbury et al. (1991) <sup>25</sup>	unclear	unclear	high	high	high	low	low
Hse and Wei (1997) <sup>16</sup>	low	unclear	low	high	high	low	low
Marks et al. (1999) <sup>17</sup>	unclear	unclear	high	high	high	low	low
Welbury et al. (2000) <sup>26</sup>	low	unclear	low	high	high	low	low
Dutta et al. (2001) <sup>18</sup>	unclear	unclear	high	high	high	low	low
Duggal et al. (2002) <sup>27</sup>	low	unclear	high	high	high	low	low
Hübel and Mejäre (2003) <sup>21</sup>	low	unclear	low	high	high	low	low
Kavvadia et al. (2004) <sup>28</sup>	low	unclear	high	high	high	low	low
Andersson-Wenckert and Sunnegardh-Grönberg (2006) <sup>19</sup>	unclear	unclear	low	high	high	low	low
Pascon et al. (2006) <sup>29</sup>	low	unclear	low	high	high	low	low
Alves dos Santos et al. (2010) <sup>14</sup>	low	unclear	low	high	high	low	low
Casagrande et al. (2013) <sup>20</sup>	low	unclear	low	high	high	low	low
Sengul and Gurbuz (2015) <sup>15</sup>	low	unclear	low	high	high	low	low
Bektas Donmez et al. (2016) <sup>30</sup>	low	unclear	low	high	high	low	low

**Network meta-analysis**

Nine possible direct pair-wise comparisons were performed between the five restorative materials (results not shown). The relative risk was significantly higher for GIC when compared with CP (RR=4.00; 95% CI: 1.19-13.41), RMGIC (RR=4.70; 95% CI: 1.09-20.27) and AM (RR=1.62; 95% CI: 1.05-2.52). Only the comparison between GIC and CR did not have direct evidence. In addition, the relative risk was significantly smaller for RMGIC when compared with AM (RR=0.60; 95% CI: 0.42-0.86).

A network analysis of evidence comparing the five restorative materials (CR, AM, GIC, CP and RMGIC) was performed for all comparison pairs. The network is displayed in Figure 2.

The homogeneous variance random effects model show the best fit according to DIC values (62.98 against 64.44). The results from this model and using the split node method are shown in Table 3. The p-value is for inconsistencies between direct and indirect evidence for each comparison pair in a closed loop of evidence. All the p-values are high indicating no inconsistency justifying the use of the mixed treatment comparison (MTC) model. Results from this model show that the relative risk is significantly higher for GIC when compared



Restorative materials: CR: composite resin; AM: amalgam; GIC: conventional glass ionomer cement; CP: compomer; RMGIC: resin-modified glass ionomer cement.

**Figure 2.** Comparisons network of conventional restorative materials placed in primary teeth. The width of lines connecting each pair of treatment is proportional to the number of trials comparing the treatments.

with CP (RR=2.64, 95% CI: 1.29-6.27), RMGIC (RR=3.25, 95% CI: 1.58-7.96), AM (RR=2.25, 95% CI: 1.17-5.35) and CR (RR=3.27; 95% CI: 1.55-8.13).

**Table 3.** Mixed treatment comparison (MTC) model comparing all the direct restorative materials used in primary teeth.

Pair-wise comparison	Direct comparison	Indirect comparison	MTC	p-value
GIC-CP	4.67 (1.12,25.92)	2.18 (0.86,6.12)	2.64 (1.29,6.27)	0.38
GIC-RMGIC	5.94 (1.22,48.80)	2.87 (1.15,8.01)	3.30 (1.58,7.96)	0.44
GIC-AM	1.65 (0.62,4.33)	4.22 (1.35,16.52)	2.25 (1.17,5.35)	0.19
GIC-CR	-	-	3.27 (1.55,8.13)	-
CP-RMGIC	0.93 (0.39,2.15)	1.80 (0.73,4.96)	1.23 (0.72,2.16)	0.25
CP-AM	1.31 (0.62,3.06)	0.60 (0.29,1.21)	0.85 (0.51,1.49)	0.11
CP-CR	1.11 (0.53,2.26)	1.78 (0.62,5.99)	1.23 (0.75,2.07)	0.43
RMGIC-AM	0.61 (0.21,1.73)	0.76 (0.36,1.58)	0.69 (0.40,1.23)	0.68
RMGIC-CR	1.06 (0.57,1.93)	0.88 (0.27,2.84)	1.00 (0.61,1.64)	0.73
AM-CR	1.53 (0.71,3.59)	1.35 (0.57,2.79)	1.44 (0.84,2.41)	0.79

**Table 4.** Ranking of materials according to probability of failure.

Materials	Position 1*	Position 2	Position 3	Position 4	Position 5**
GIC	0.0005	0.0009	0.0023	0.0104	0.9856
CP	0.0898	0.1875	0.4849	0.2334	0.0042
RMGIC	0.4472	0.3531	0.1535	0.0451	0.0009
AM	0.0265	0.0674	0.2204	0.6771	0.0083
CR	0.4358	0.3909	0.1385	0.0338	0.0008

\*Smaller probability of restoration failure; \*\*Larger probability of restoration failure.

Table 4 presents the ranking of treatments according to their probability of higher longevity. The order from lowest to highest probability of failure was RMGIC, CR, CP, AMG and GIC. The probability of failure of GIC was 0.9856.

## Discussion

There is a lack of strong evidence establishing the most suitable conventional material for restoring primary molars. Therefore, the present systematic review and network meta-analysis aimed to answer the following question: “Is there a best conventional material for restoring posterior primary teeth?”. A previous similar systematic review addressed this question.<sup>6</sup> However, the study included only three trials comparing four different types of materials in

the primary dentition: crown restoration (esthetic and stainless steel crowns), RMGIC, AM and CP; no significant differences were found for the outcomes assessed.

Our network meta-analysis found that GIC had a higher risk of failure compared to all the other conventional restorative materials. This is an important finding since GIC has been widely used for restoration of primary teeth because of its several advantages including fluoride release, chemical bonding to enamel and dentin, tooth preparation with minimal removal of sound structure, biocompatibility and being user-friendly.<sup>21,31,32</sup> Nevertheless, this material presents disadvantages such as low wear resistance and flexural strength. To overcome the brittle nature of this cement and improve its physical properties, modifications on its original composition were developed, such as the RMGIC.<sup>32,33</sup>

One included study compared the clinical performance of GIC and RMGIC restorations. In the 3-year follow-up study by Hübel and Mejàre,<sup>21</sup> the risk of failure of a class II restoration was more than five times higher with GIC (Fuji II, GC) than with RMGIC (Vitremar, 3M ESPE). This is in accordance with a previous systematic review that did not recommend GIC for class II cavities in primary molars and showed that RMGIC presented better performance in small to moderate size proximal restorations.<sup>34</sup> Moreover, the three studies comparing



GIC with other materials<sup>21,25,26</sup> used conventional GIC (Chemfil Superior, Ketac Fil, Fuji II). Therefore, more clinical studies comparing high-viscosity GIC with other conventional restorative materials are needed, since this material is a viable option for restoring primary molars.<sup>35</sup> It is important to highlight that high-viscosity GIC used following the ART approach have shown similar survival rates in primary molars compared with conventional technique (drilling and restoring and/or hand excavation associated with resin composite, amalgam, or compomer).<sup>36,37</sup>

The follow-up period ranged from 12 to 60 months, but most studies followed the patients for 24 months. Therefore, we tried to pool the follow-up periods for analysis in an attempt to not jeopardize any material with longer follow-up. However, the pooling was not possible, which was considered a limitation of this systematic review. Since there was no randomized clinical trial comparing GIC and CR restorations, indirect comparisons by means of a mixed treatment comparisons meta-analysis were carried out. The pair-wise comparisons of GIC *vs.* RMGIC<sup>21</sup> and CR *vs.* RMGIC<sup>19,20</sup> showed higher risk of failure for GIC compared to CR. This finding is in line with a retrospective study with 4 years of follow-up that found that CR restorations in primary teeth presented lower failure rate than GIC ones.<sup>38</sup>

Although the MTC model did not found a significantly difference among CP, RMGIC, AM, and CR, the ranking based on probability of failures showed that RMGIC and RC are in the best position, with lower probability, CP and AM in intermediate position, and GIC in the worst position, consistent with the network meta-analysis findings. CR has a wide range of applications in Dentistry. As an esthetic and versatile material,<sup>39</sup> it presents a lower annual failure rate (9.5%) in posterior restorations compared to other esthetic materials.<sup>38</sup> Furthermore, CR allows the preservation of tooth structure because of its adhesive properties.<sup>40</sup> On the other hand, RMGIC retains the advantages of GIC (fluoride release, biocompatibility, physiochemical bonding to the tooth, favorable thermal expansion and contraction) but present better fracture and wear resistance than GIC.<sup>32</sup>

Regarding commercial brands, Vitremer (3M ESPE, St Paul, MN, USA) was used in 57.1% of the RCTs evaluating RMGIC restorations. Dyract (Dentsply De Trey, Konstanz, Germany) was the material of choice in 77.8% of RCTs that used CP. The brands of AM, CR and GIC varied considerably among studies. It is important to consider the variability of the selected studies, including different materials, types of cavities, sample sizes, follow-up periods, restorative techniques and operative field isolation techniques. However, a systematic review has showed that the isolation technique does not influence the longevity of restorations.<sup>41</sup> Furthermore, in all included studies, trained operators performed the restorative procedures.

Our review included clinical studies from the 1980s to 2016, and thus, some of the restorative materials evaluated are no longer available. Moreover, the majority of the studies showed unclear or high risk of bias. Some parameters that could interfere in risk of bias analysis were not reported. Nevertheless, random sequence generation was reported in the majority of the studies. Finally, blinding is not feasible when comparing different restorative materials and can be considered an inherent characteristic of the study design.

Therefore, further randomized controlled clinical investigations are needed to compare different materials and techniques, using standardized methodology to evaluate the success of restorative treatments in primary dentition.

## Conclusions

Based on this study's results, the following conclusions can be made:

Conventional glass ionomer cement in primary molars conventional restorations had higher risk of failure than other restorative materials.

There is no advantage among restorative treatments using compomer, resin-modified glass ionomer cement, amalgam and composite resin. Thus, clinical decision-making will depend on the ability of the professional, the individuality of the case, and the patient's wish.

## References

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