SPIDER TOOL FOR RESEARCH QUESTION FORMULATION

SEARCH STRATEGY	INCLUSION CRITERIA	EXCLUSION CRITERIA
Sample	Patients aged between 2-12 years	Patients with developmental dental anomalies
Phenomena of Interest	Patients receiving biological restorations in the form of tooth fragments (autogenic or allogenic)	“Biological” word used in a context apart from tooth or teeth fragment restoration
Design	• Case Reports in English • Thorough detailing of a tooth to be restored, including hydration protocol, sterilization methods used, and bonding strategies employed	Follow-up not mentioned or done for less than 12 months
Evaluation	Clinical Outcomes and Commentaries on appraised studies	-
Research Type	Qualitative	-

SEARCH STRATEGY WITH APPLIED LIMITS/FILTERS

Database	Search strategy	Limits	Hits
PubMed	(("biological restoration#") AND (("tooth") OR ("teeth")) ("fragment#"))	Age: 0-12 years, Language: English, Type of article: Case Reports	2
	(("attachment") OR ("reattachment")) AND (("tooth") OR ("teeth")) AND "fragment"		47
ScienceDirect	(("biological restoration#") AND (("tooth") OR ("teeth")) ("fragment#"))	Article type: Research Articles	6
Google Scholar	(("biological restoration#") AND (("tooth") OR ("teeth")) ("fragment#")) AND (("pediatric") OR ("paediatric"))	Language: English	63
ProQuest	(("biological restoration#") AND (("tooth") OR ("teeth")) ("fragment#")) AND (("pediatric") OR ("paediatric"))	Source: Scholarly Journals	12
Cochrane Library	("tooth fragment") OR ("biological restoration")	Language: English	10
TRIP Database	(("attachment") OR ("reattachment")) AND (("tooth") OR ("teeth")) AND "fragment"	Type: Primary Research	32
MedNar	(("biological restoration#") AND (("tooth") OR ("teeth")) ("fragment#")) AND (("pediatric") OR ("paediatric"))	Type: Medical articles; Sub: Anterior teeth	5
Global Index Medicus	(("attachment") OR ("reattachment")) AND (("tooth") OR ("teeth")) AND "fragment"	Language: English	16

THEMATIC SYNTHESIS AFTER LINE-BY-LINE CODING

	THEMES				
CASES	**TECHNIQUE**	**TREATMENT OF CHOICE**	**OUTCOME**	**LIMITATIONS**	**ADVANTAGES**
Alcantara et al	*(No related code identified)*	"Careful consideration of extent and pattern of fracture, endodontic involvement and the possibility of using the fragment in the reattachment process"	"Clinical and radiographic findings showed good functional and esthetic results after 1 year"	"Tooth fragment obtained from another patient may be rejected" "Low number of Human Teeth Banks" "Limited dissemination of the technique"	"Excellent adhesion" "Biocompatibility" "Resilience that is compared to the original tooth" "Better distribution of stress along the root"
Bariker et al	"Simple" "Length of each appointment is reduced"	"Using biological and post-restoration for restoring teeth affected by ECC has shown promising results when compared to the conventional method"	"Positive change in behavior, speech and self-esteem" "Improved psychological behavior and patient acceptance"	"Difficulty in obtaining teeth with required coronal dimensions and characteristics, problems inherent to indirect restorations and match fragment color with tooth remnant" "Having fragments from other people's teeth in their mouth is not a pleasant idea for some patients"	"Excellent esthetics" "Physiologic wear" "Superficial smoothness" "Compatible cervical adaptation" "Biofunctional" "Morphofunctional"
Bharati et al	"Quick" "Easy to perform"	"Restoration of the tooth using its fragment represents the first-choice treatment"	"Restoration of immediate esthetics and function"	"Excessive masticatory forces" "New trauma to the restored tooth"	"Re-establishes contour and architecture" "Original brightness" "Esthetic" "Conservative"
Goncalves-sena et al	"Short execution time"	"Autogenous fragment bonding preferable to restorations with composite resin or porcelain"	"Excellent esthetic, functional and psychosocial recovery"	"Dehydration can alter bio-structural characteristics"	"Excellent esthetics" "Morphofunctional" "Maintenance of the previous guide" "Physiologic incisor wear" "Satisfactory gingival health"
Grewal et al	"Less technique sensitive"	*(No related code identified)*	"Positive change in behavior, speech and self-esteem"	"Patient acceptance is an important issue" "Donor selection from siblings could be a more acceptable alternative"	"Meets up to the structural and esthetic standards of the teeth"
Jain et al	"Less technique sensitive"	*(No related code identified)*	"Excellent esthetic, functional and psychosocial results"	"Patient may refuse to accept a tooth fragment from another patient"	"Morphofunctional" "Strengthened root canals" "Reduced dentin stress" "Adapts to canal configuration" "Excellent adhesion" "Provides resilience"
Mathur et al	"Simple" "Less clinical chair time" "Requires a laboratory phase" "Requires professional expertise"	"Viable restorative alternative"	"Clinical success as well as recovered proper functional anatomy of tooth"	"Difficulty in obtaining teeth with required coronal dimensions and characteristics, problems inherent to indirect restorations and match fragment color with tooth remnant" "Having fragments from other people's teeth in their mouth is not a pleasant idea	"Excellent esthetics" "Preserves natural tooth color" "Physiologic wear" "Biofunctional" "Superficial smoothness" "Compatible cervical adaptation"
Martos et al	*(No related code identified)*	"Excellent approach in the treatment of coronal fracture"	"Function and esthetics were successfully re-established"	"Extensive destruction of the coronal fragment of fractured tooth" "Original color may not recover" "Attachment in incorrect position"	"Preserves esthetics" "Restores masticatory function" "Immediate positive emotional response"
Mittal et al	"Less chairside time"	"Prime factors to be borne in mind while	"Biologic posts provide an inexpensive,	"Increased chairside time in fabrication of biologic	"Natural tooth anatomy"

		selecting the appropriate intra-canal posts are biocompatibility, ease of applicability and availability"	biocompatible, and esthetic solution for intracanal reinforcement of primary teeth broken down to the cervical level. Biologic shell crown, although being an economic and esthetic option for restoration of primary anterior and posterior teeth, face limitation of limited availability and longer chairside time."	shell crowns" "Parents may find this technique objectionable and unacceptable" "Absence of established tooth banks"	"Physiologic wear" "Satisfied child and parent"
Moura et al	"Less time consuming" "Long time required for laboratory preparation" "Difficult"	"When fracture carries minimal or no violation of biological width and when the fragment is available…"	"Esthetically and functionally in good condition"	"Fracture line may become visible over time" "Dehydration can cause irreversible discoloration" "Excessive pressure may lead to failure"	"Better esthetics" "Physiologic incisal wear" "Positive emotional and social response"
Naudi et al	*(No related code identified)*	"Preferred if the fragment is available"	"Tooth fragment reattachment can be satisfactorily used"	"Dehydration can cause less than ideal esthetics" "Technique becomes more complicated when there are multiple tooth fragments" "Predictable eventual separation of repair because of failure of bonded junction" "Unknown longevity" "Horizontal traction, non-physiologic use and traumatic injury to a restored tooth can lead to failure"	"Conservative" "Superior esthetics" "Occlusal contacts are preserved" "Incisal edge translucency is maintained" "Original tooth contours maintained" "Physiologic wear"
Nogueira et al	"Little known technique"	"Most commonly recommended technique whenever possible"	"Biopins are alternative to conventional techniques and favors the dental esthetics and function"	"Difficulty of acquisition of extracted teeth" "Tooth fragment obtained from another patient may be rejected" "Low number of human teeth banks" "Limited dissemination of the technique"	"Excellent esthetics" "Excellent smoothness" "Maintenance of incisor guide" "Physiological and natural characteristic of the dental structure" "Excellent biocompatibility"
Pomarico et al	"Chair time is shorter"	"Shorter chair time is a distinct plus in pediatric dentistry"	"Superior clinical and microscopic outcome" "Higher success rate in sealing the interface tooth-restoration was obtained by the biologic bonding method"	"Reliance on existing teeth banks and spend 2 appointments"	"Low surface erosion" "Optimal adaptation"
Sanches et al	"Simple"	"Viable restorative alternative"	"Biological restoration technique using tooth fragments has a practical clinical applicability and is a viable, cost-effective restorative procedure for primary teeth with severely damaged crowns"	"Difficulty in obtaining teeth with required coronal dimensions and characteristics, problems inherent to indirect restorations and match fragment color with tooth remnant" "Having fragments from other people's teeth in their mouth is not a pleasant idea for some patients"	"Excellent esthetics" "Preservation of sound tooth structure" "Maintenance of pulp vitality" "Physiologic wear" "Superficial smoothness" "Compatible cervical adaptation" "Biofunctional" "Morphofunctional"

CHARACTERISTICS OF INCLUDED STUDIES

Author	Year	Age (years)	Tooth (FDI)	# type	Area of tooth restored	Etiology	Tooth prep	Sterilization or disinfection of fragment	Bonding strategy	Hydration	Follow-up (months)
Alcantara et al[1]	2010	12	11	Ellis Class 3	Crown + Posts	Trauma	Post space prep	121 degrees for 15 min	Dual cure resin	Saline solution	12
Bariker et al[2]	2014	3.5	52, 62		Posts	Cavitations	Post space prep	Sterilized but technique not mentioned	Flowable composite	Similar color shade from tooth bank	12
Bharati et al[3]	2018	13	21	Ellis Class 2	Crown	Trauma	External chamfer bevel	2% CHX	Light-cure composite resin	Saline solution	12
Goncalves-Sena et al[4]	2012	13	11	Ellis Class 3	Crown + Posts	Trauma	Post space prep	Calcium hydroxide solution	Chemically cured composite resin	Saline solution	24

Grewal et al[5]	2008	3 & 4	51, 52 61, 62		Crown + Posts	Cavitations	Post space prep	Sterilized in tooth bank	Dual cure resin-modified GIC	HBSS 4 degrees	12
Jain J et al[6]	2015	10	31, 41	Ellis Class 3	Posts	Trauma	Post space prep	121 degrees for 15 min	Light-cure composite resin	Not required	12
Martos et al[7]	2017	12	11	Ellis Class 2	Crown	Trauma	Double chamfer	2% CHX	Microhybrid composite resin	Water	48
Mathur et al[8]	2012	7	75		Crown	Cavitations	Core built with composite	121 degrees for 20 min	Dual cure resin	HBSS 4 degrees	12
Mittal et al[9]	2014	4(2) & 7(1)	51, 52 61, 62 73, 83 84		Crown + Posts	Cavitations	Post-space prep and vertical grooves	121 degrees at 15 lbs for 15 min	Dual cure resin	Similar color shade from tooth bank	12
Moura et al[10]	2013	9	21	Ellis Class 2	Crown	Trauma	Internal dentin groove	121 degrees for 15 min	Self-cure resin	Water	216

Naudi et al[11]	2007	11	11	Ellis Class 2	Crown	Trauma	Internal dentin groove	2% CHX	Light-cure Composite resin	Saline solution	12
Nogueira et al[12]	2015	9	21	Ellis Class 2	Crown with dentin biopins	Trauma	Post space prep	121 degrees for 15 min	Light-cure composite resin	Similar color shade from tooth bank	12
Pomarico et al[13]	2011	4	85		Crown	Cavitations	Not required	Sterilized in tooth bank	Light-cure Composite resin	Similar color shade from tooth bank	60
Sanches et al[14]	2007	4 & 5	74, 75		Crown	Cavitations	Retention grooves	120 degrees for 20 min	Light-cure composite resin	Similar color shade from tooth bank	48

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