Comparisons of Direct Restorative Dental Materials

	TYPES OF DIRECT RESTORATIVE DENTAL MATERIALS			
COMPARATIVE FACTORS	AMALGAM	COMPOSITE RESIN (DIRECT AND INDIRECT RESTORATIONS)	GLASS IONOMER CEMENT	RESIN-IONOMER CEMENT
General Description	Self-hardening mixture in varying percentages of a liquid mercury and silver-tin alloy powder.	Mixture of powdered glass and plastic resin; self-hardening or hardened by exposure to blue light.	Self-hardening mixture of glass and organic acid.	Mixture of glass and resin polymer and organic acid; self hardening by exposure to blue light.
Principle Uses	Fillings; sometimes for replacing portions of broken tooth.	Fillings, inlays, veneers, partial and complete crowns; sometimes for replacing portions of broken teeth.	Small fillings; cementing metal & porcelain/metal crowns, liners, temporary restorations.	Small fillings; cementing metal & porcelain/metal crowns, and liners.
Resistance to Further Decay	High; self-sealing characteristic helps resist recurrent decay; but recurrent decay around amalgam is difficult to detect in its early stages.	Moderate; recurrent decay easily detected in early stages.	Low-Moderate; some resistance to decay may be imparted through fluoride release.	Low Moderate; some resistance to decay may be imparted through fluoride release.
Estimated Durability (permanent teeth)	Durable	Strong, durable.	Non-stress bearing crown cement.	Non-stress bearing crown cement.
Relative Amount of Tooth Preserved	Fair; Requires removal of healthy tooth to be mechanically retained: No adhesive bond of amalgam to the tooth.	Excellent; bonds adhesively to healthy enamel and dentin.	Excellent; bonds adhesively to healthy enamel and dentin.	Excellent; bonds adhesively to healthy enamel and dentin.
Resistance to Surface Wear	Low Similar to dental enamel; brittle metal.	May wear slightly faster (ban dental enamel.	Poor in stress-bearing applications. Fair in non-stress bearing applications.	Poor in stress-bearing applications; Good in non-stress bearing applications.
Resistance to Fracture	Amalgam may fracture under stress; tooth around filling may fracture before the amalgam does.	Good resistance to fracture.	Brittle; low resistance to fracture but not recommended for stress-bearing restorations.	Tougher than glass ionomer; recommended for stress-bearing restorations in adults.
Resistance to Leakage	Good; self-sealing by surface corrosion; margins may chip over time,	Good if bonded to enamel; may show leakage over time when bonded to dentin: Does not corrode.	Moderate; tends to crock over time.	Good; adhesively bonds to resin, enamel, dentine/ post-insertion expansion may help seal the margins.
Resistance to Occlusal Stress	High; but tack of adhesion my weaken the remaining tooth.	Good to Excellent depending upon product used.	Poor; not recommended for stress-bearing restorations.	Moderate; not recommended to restore biting surfaces of adults; suitable for short-term primary teeth restorations.
Toxicity	Generally safe; occasional allergic reactions to metal components. However amalgams contain mercury. Mercury in its elemental form is toxic and as such is listed on prop 65.	Concerns about trace chemical release are not supported by research studies. Safe; no known toxicity documented. Contains some compounds listed on prop 65.	No know incompatibilities. Safe; no known toxicity documented.	No known incompatibilities. Safe; no known toxicity documented.
Allergic or Adverse Reactions	Rare; recommend that dentist evaluate patient to rate out metal allergies.	No documentation for allergic reactions was found.	No documentation far allergic reactions was found. Progressive roughening of the surface may predispose to plaque accumulation and periodontal disease.	No known documented allergic reactions; Surface may roughen slightly over time; predisposing to plaque accumulation and periodontal disease if the material contacts the gingival tissue.
Susceptibility to Post-Operative Sensitivity	Minimal; High thermal conductivity may promote temporary sensitivity to hot and cold; Contact win other metals may cause occasional and transient galvanic response.	Moderate; Material is sensitive to dentist's technique; Material shrinks slightly when hardened, and a poor seal may lead to bacterial leakage, recurrent decay and tooth hypersensitivity.	Low; material seals well and does not irritate pulp.	Low; material seals well and does not irritate pulp.
Esthetics (Appearance)	Very poor. Not tooth colored: initially silver-gray, gets darker, becoming black as it corrodes. May stain teeth dark brown or Hack over time.	Excellent; often indistinguishable From natural tooth.	Good; tooth colored, varies in translucency.	Very good; more translucency than glass ionomer.
Frequency of Repair or Replacement	Low; replacement is usually due to fracture of the filling or the surrounding tooth.	Low-Moderate; durable material hardens rapidly; some composite materials show more rapid wear than amalgam. Replacement is usually due to marginal leakage.	Moderate; Slowly dissolves in mouth; easily dislodged.	Moderate; more resistant to dissolving than glass ionomer, but less than composite resin.
Relative Costs to Patient	Low, relatively inexpensive; actual cost of fillings depends upon their size.	Moderate; higher than amalgam fillings; actual cost of fillings depends upon their size; veneers & crowns cost more.	Moderate; similar to composite resin (not used for veneers and crowns).	Moderate; similar to composite resin (not used for veneers and crowns).
Number of Visas Required	Single visit (polishing may require a second visit)	Single visit for fillings; 2+ visits far indirect inlays, veneers and crowns.	Single visit.	Single visit