In dentistry, glass fiber reinforced dental composites (GFRC) are widely used due to mutual benefit of sufficient strength and acceptable esthetics. GFRC are noncrystalline, homogenous, and fundamentally a three-dimensional mesh of silica, oxygen, and different ions organized arbitrarily (Chong and Chai, 2003). In dentistry, the organic matrix is normally based on dimethacrylate-based resins or polyacrylates, which is strengthened by glass fibers. However, silane coupling agent is used to improve adherence of resin to filler surfaces. It is the difunctional surface active compound that adheres to filler particle surface and also coreacts with resin monomer of organic matrix (Khan et al., 2015; Stipho, 1998; Tanimoto et al., 2004; Solnit, 1991; Park et al., 2000). It makes the polymer matrix more flexible to transfer stresses to higher modulus fibers. The main coupling agent used is organosilane compound (ϒ-methacryloxypropyl trimethoxysilane). Resin-based composite restorations tend to fail over time due to inadequate physical properties while fiber-reinforced composites can better be used for restorative purposes as they show 10% improvement in physical properties comparatively.

GFRC is very popular in dental applications (Fig. 17.7) including fixed partial dentures (Manley et al., 1979; Krause et al., 1989; Stiesch-Scholz et al., 2006), endodontic post systems (Bell et al., 2005; Chieruzzi et al., 2014), periodontal splints (Meiers et al., 1998; Kumbuloglu et al., 2011; Hoeppner et al., 2011), orthodontic space maintainers (Garoushi et al., 2013; Nidhi et al., 2012), and tooth build up and tooth restorations (Säilynoja et al., 2013; Garoushi et al., 2012a).

There are different types of glass fibers; however, E glass fibers are commonly used in dentistry (Lukkassen and Meidell, 2003). The different types of glass fibers are shown in Table 17.2 (Li et al., 2013; Vallittu, 1998; Larson et al., 1991).

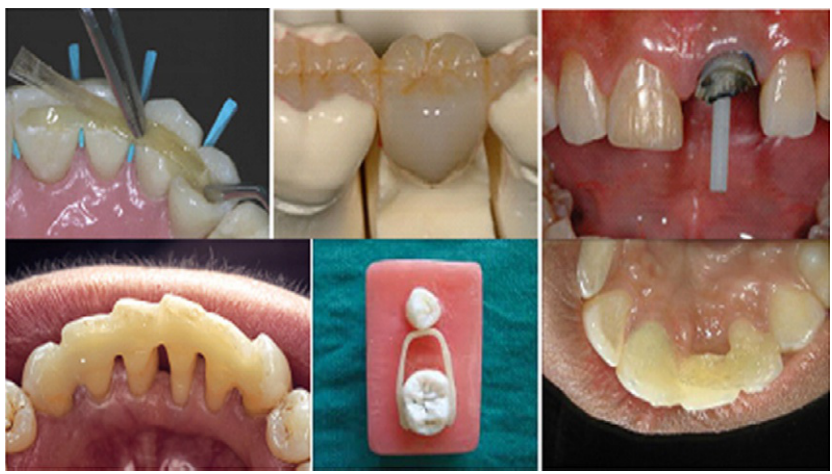

FIG. 17.7 Dental applications of glass fiber reinforced dental composite (Khan et al., 2015).