and stuck them onto the model by placing a soft rope wax over the cusp tips, then embedded the occlusal rest of the height gauges in the wax until they contacted the incisal surfaces of the teeth and the bases contacted the labial surfaces of the teeth. Then molded a soft strip of cold-cure acrylic to cover and connect the occlusal rests of the height gauges to make the transfer tray. A double transfer tray method was described by Echarri and Kim (2004; 2006). They used elastomeric ring and wax to block out the under cut of the brackets. Then the individual tray was made by light cure acrylic for each tooth, finally joining the tray together by silicone impression material.

An interesting individualised bonding tray was described by Miyazawa and co-workers (2004). In this technique, teeth were sectioned off individually from the working model and brackets were bonded on them using composite. After that the brackets were covered by a transparent soft silicone impression material (Memosil 2). Acrylic veneer was then formed over the hardened silicone and labial surface of the teeth by thermoplastic acrylic sheet of 0.125 inch using a vacuum machine, followed by trimming and polishing individually.

Adhesives for Clinical Bonding

There has been a long history of using chemical cure (self-cure) adhesive for clinical bonding in the indirect technique. Newman (1974) was reported to use an acrylated epoxy adhesive for indirect bonding. Gottlieb and co-workers (1974) used Atuo-Tach, which polymerized rapidly in the warm environment. Restorative composite (Concise Enamel) was also used for indirect bonding (Moshiri and Hayward, 1979; Thomas, 1979; Aguirre, 1984). Fried and Newman (1983) used a no-mix adhesive (Contacto), in which the no-mix paste was put onto the bracket and the primer was painted onto the teeth. Once in contact, the no-mix adhesive set in 3 minutes. Other chemical cure adhesives like unfilled resin (Sinha et al., 1995; Moskowitz et al., 1996), the two-paste system (Hickham, 1993; White, 1999), and lightly filled resin adhesive (Kalange, 1999; Sondhi, 1999; Sondhi, 2001; Kothari, 2006; Guenthner and Larson, 2007; Kalange, 2007; Sondhi, 2007) were also be used for bonding in the indirect technique. However, self-cure adhesives of different chemical compositions had also been used in indirect bonding, like resin-reinforced glass ionomers (Silverman et al., 1997) and cyanoacrylates (Klocke et al., 2003c; Klocke et al., 2003b; Rajagopal et al., 2004).

Command-set adhesive for use in indirect bonding was described as early by Gottlieb and co-workers (1974) using ultraviolet-curing adhesive. Visible light-cure resin was the most commonly reported command-set adhesive for use in indirect bonding (Read, 1987; Read and O'Brien, 1990; Reichheld et al., 1990; Cooper and Sorenson, 1993; Read and Pearson, 1998; McCrostie, 2003; Rajagopal et al., 2004; Higgins, 2007). White (2001) illustrated the use of light-cure adhesive and self-etching primer, making the indirect bonding further simplified and fast. Miles (2002) used a filled flowable composite in the indirect bonding technique. This type of composite was developed for use in restorative dentistry for air abrasion, tunnel preparations, shallow Class V cavities, and as a fissure sealant. When it was used for bracket bonding, it had the merits of reducing voids, good handling characteristics, and it has a command set based.

An interesting bonding technique was described by Miyazawa and co-workers (2004), which was claimed to reduce the risk of caries. This technique was first treating the teeth by 20% polyacrylic acid. Then a thin layer of diluted glass ionomer cement was painted onto the teeth. After setting, light-cured composite was used to bond brackets onto the thin glass ionomer surface using individualized veneer bonding transfer tray. It was claimed that the glass ionomer cement veneer release fluoride and protect the teeth from caries.

Computer-aided indirect bonding

Recent technology develops rapidly nowadays. Orthodontics, especially indirect bonding, is no exception. With the help of a high technology computer-driven system called SureSmile (Orametrix, Inc., Richardson TX), we could capture three-dimensional digital images of the dentition intraorally (Mah and Sachdeva, 2001; Sachdeva, 2001; Sachdeva et al., 2005; Muller-Hartwich et al., 2007). These images could be manipulated in the form of a diagnostic setup and brackets could be positioned virtually in the computer. Customised orthodontic archwire and indirect bonding trays could be constructed by this system as well.

Similar systems involving a computer-aided design/computer-aided manufacturing (CAD/CAM) processes and rapid prototyping to prepare custom trays for orthodontic bonding was developed. It began with the scanning of the dental stone model using a high-resolution optical 3-dimensional (3D) scanner (Joffe, 2004; Redmond et al., 2004; Ciuffolo et al., 2006). Then the desired commercial brackets (previously incorporated in the software database) were virtually positioned onto each tooth and the virtual transfer tray was created. Finally a high-end rapid prototyping machine was used to convert the virtual trays into the final real product, which was made of a rigid-elastic plastic material. Furthermore, a custom made orthodontic bracket system based on the digital model was also developed (Mujagic et al., 2005). This helped the clinician to save time and achieve more accurate bracket placement. **DA**

In the next installment, readers can look forward to further discussion on indirect bonding, with topics such as bracket position accuracy, bond strength and popularity.