Captek Composite Metal Bridges

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[QA. Please provide citations for the tables.]

During the past 10 years, Captek (Captek: A Division of Precious Chemicals Comany) crowns and bridges have emerged as strong, esthetic, healthy, highly accepted restorations. They have earned this reputation as a result of the properties associated with its unique composite metal structure (Figure 1).[1,2] [QA. Briefly explain the properties that make it unique.]

Dentists who use Captek single restorations are not always aware of its potential to provide the requirements in fixed partial dentures (Figure 2). In fact, the original development of the composite metal technology was to address the specific needs of bridgework. This article will explain the rationale and research behind Captek, its features, and the clinical benefits of the system.

Figure 1—Both the Captek abutments and the connection material for bridges and splints derive their unique properties from the composite gold nature.

Captek composite metal bridges provide the esthetic and strength requirements for dentists and their patients.

Even today, porcelain-fused-to-metal bridges are accepted as the dental standard for longevity and predictability; but the typical esthetic challenges associated with metal ceramics has created a desire for dentists and technicians to look toward other, often less tested and potentially more problematic, metal-free options. Captek composite metal bridges provide the esthetic and strength requirements for dentists and their patients.

The intention of the inventors (Itzak Shoher, DMD and Ahrone Whiteman, MDT) was to incorporate strength, fracture resistance, accuracy of fit, shock absorption, esthetics, and predictability into their crowns and bridges—to develop a material system that combined these particular physical properties. Captek composite metal frameworks are the result of this effort. One will see in the laboratory fabrication process presented below how Captek incorporates rigidity in the pontic area and a measured degree of resiliency in the abutments. Using the composite metal copings for the abutments together with a high palladium, rigid connector puts the materials with the proper physical properties in the place where those physical properties are ideal. Another tremendous advantage when connecting the pontic to the Captek abutments in the manner described below is the potential for stable, consistent, complete fits.

Figure 2—Notice the vitality of the ceramic supported by the nonoxidizing, light-scattering nature of the composite gold.

Fabrication Process

Captek bridges are constructed from two basic components: Captek abutment copings and traditionally cast pontics made of either noble or high noble ceramic alloy (Figure 3). The Captek abutments and pontics are joined together by one of three well-tested methods:

1. Soldering the pontic between the abutments using composite metal technology.
2. Using the direct cast-to method.
3. Using a laser-welding method.

The remainder of this article will review the original technique, which will help to explain the overall bridge philosophy.[3]

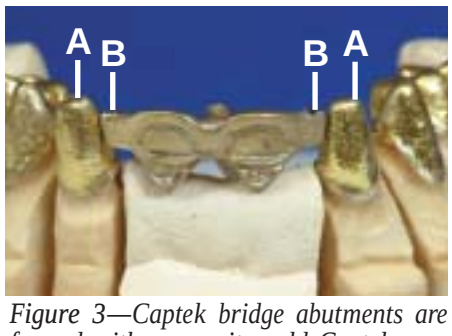

Figure 3—Captek bridge abutments are formed with composite gold Captek copings (a) and a high palladium content rigid pontic/connector (b).

After fabricating and seating the abutment copings on their respective dies, the pontic is positioned between them, leaving a 0.3-mm to 0.5-mm gap adjacent to each abutment. The components are accurately connected on the master model, after which they are invested in soldering investment. After the setting of the investment, the joint area is cleaned and liquid Pro Shine [QA. Who makes this product?] flux is applied to eliminate excessive oxidation of the pontic during the soldering process.

The same technology that was used to create the composite metal abutments is used to connect the pontic to the abutments (Figure 4). First, the Capcon powder (analogous to Captek P) is mixed with an alcohol-based liquid and applied to the joint space using a small brush. The Capcon powder creates the internal skeleton of high-fusing hard particles of platinum/palladium.

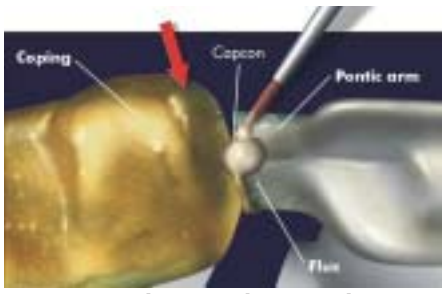

Figure 4—The space between the pontic and the abutments is coated with a flux and then filled with the composite metal connection material (Capcon).

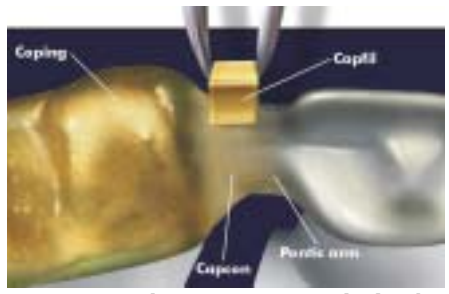

Figure 5—When Capcon is applied, a bar of high purity gold (Capfil) is placed on top of each connection.

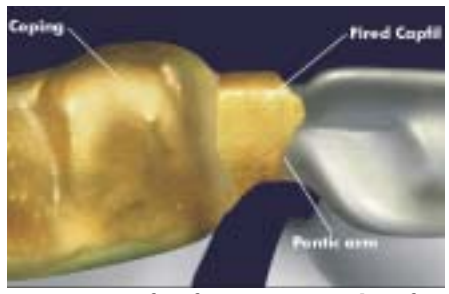

Figure 6—After firing in a porcelain furnace, the skeleton material connects, creating the internal reinforcement. This acts like a sponge thus drawing in the high purity gold of the Capfil.

Figure 7—Notice the warm, soft gold color of the Captek frame ready for porcelain application.

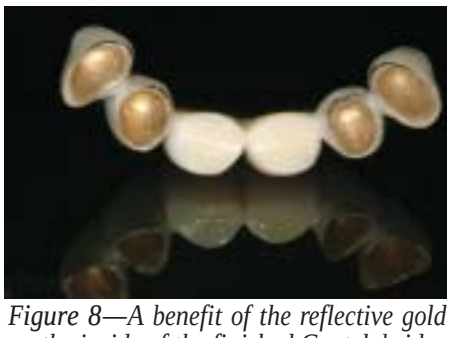

Figure 8—A benefit of the reflective gold on the inside of the finished Captek bridge is that root shadowing is minimized.

Figure 9—The Captek composite gold understructure provides strength and stability in addition to enhancing the highly esthetic result.

Table 1—Standard Clinical Guidelines

Preparation and Cementation for Captek Bridges

Standard metal ceramic preparation and cementation:

- Occlusal clearance minimum 1.5 mm.
- Axial wall height: at least 4 mm for posterior abutments and 3 mm for anterior abutments.
- Normal retention and resistance form of preparation should be followed.
- Normal requirements for crown and bridge joint height and width.
- Margin design of dentists' choice.
- Cement of choice.
- When bonding, internal surface of Captek should be either lightly air abraded with 50 µm aluminous oxide on low pressure setting or tin plated.
- Can be temporarily cemented.

Table 2—General Information

Build-up of the Captek frame can be accomplished when and where insufficient support exists.

Acceptable pontic span length of up to 15 mm between posterior abutments or 20 mm anterior between abutments. (This usually equates to two consecutive pontics between any two abutments except with mandibular incisors where four consecutive pontics can be accommodated.)

Table 3—Additional Benefits

- Metal bands, esthetic featheredge, and porcelain margin can all be designed into framework.
- No gray lines at the margins. (Warm, nonoxidizing properties of composite metal gives vibrant esthetics, even in the gingival third of abutments.)
- Protects natural hard- and soft-tissue structures through shock absorption.
- Proven to repel plaque and bacterial surrounding abutments by 71% compared to natural tooth structure.[6]
- Exact marginal fit along with improved dimensional stability help in full and complete seating of Captek bridges, reducing frustration from poor fit associated with dimensional change of conventional alloys.
- Standard connector sizes allow for ideal embrasure development.

Small pieces of Capfil (solid high purity gold, analogous to Captek G) are then cut with wire cutters and placed on top of the joint (Figure 5). When this combination is placed in the porcelain furnace and fired, the gold melts and then infiltrates the Capcon, producing the composite metal joints (Figure 6).

During this process, the Capcon particles do not melt, but rather provide a very high-fusing metal particle matrix into which the gold melts and infiltrates, creating the composite metal structure. This process avoids the dimensional change associated with the melting and solidification of metal during traditional casting and soldering, resulting in well-fitting, stable frameworks.[4]

When fired and connected, the bridge is divested and minimally finished by smoothing the connections and refining the margins. At this point, Captek Pontic Cover material can be used to cover the dark, oxidizing cast metal pontic with a thin layer of bright, nonoxidizing Captek material. Captek couplers (either Capbond or UCP) [QA. Captek makes both of these?] are then applied to the entire bridge and fired, thus readying the framework for thin opaque application and ceramic build-up (Figure 7).

The joined cast metal pontic distributes occlusal forces equally between the composite metal abutments that, in combination with the composite metal connections, create a high strength system that also absorbs and dampens shock and stress (Figure 8). Testing done at Boston University [QA. Edits okay?] shows the load-bearing capacity[5] and the shear bond strength of Captek crowns and bridges to be at least equal to conventionally fabricated metal ceramic bridges.

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Conclusion

When Captek's unique physical properties are combined with its superb esthetic potential and plaque resistance, the results truly provide an esthetic result without compromises in strength, fit, and plaque resistance (Figure 9). ◯

Acknowledgment

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References

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