

Bridge design, part three: fixed-fixed bridgework

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Having previously discussed bridge failure and fixed-movable bridgework, Paul Tipton now turns his attentions to fixed-fixed bridgework in the third part of his series

Ante in 1926 proposed his law for bridge design that 'the total periodontal membrane area of abutment teeth should equal or surpass that of the teeth to be replaced'. This law has been used to plan and design fixed-fixed bridgework ever since.

Schwartz (1970), however, was one of the first to question this when he concluded that the introduction of a secondary or double abutment causes a greater incidence of cementation failure.

OCCLUSAL FORCES

Schwartz (1970) looked at the life span of various bridge designs related to the type of opposing dentition. He found that because of the reduced forces of occlusion, bridges lasted longest when opposed by complete dentures (Figure 1), in agreement with Boucher (1964) and Tylman (1965). Lundgren & Laurell (1986), investigating occlusal force patterns during chewing in dentitions restored with fixed bridgework, showed that the choice of chewing side is probably conditioned by the number of teeth and amount of periodontal support between the two sides. During chewing, on average only 37% of the total maximum bite force was utilised. They concluded that periodontal tissues can withstand transient occlusal forces which are much larger than those generally operating during chewing.

OCCLUSION

In general, an intercuspal holding contact should be incorporated into all units of the bridgework, including a lighter one on the



Figure 1: A 10-unit lower bridge supported by two canines opposed by a complete denture

pontic. The pontic, however, should have no lateral or protrusive guidance where possible. These forces should ideally be taken up by the abutment teeth in order to keep the loading nearer to the long axis of the tooth. Where this is impractical the guidance should be placed as near as possible to the abutment teeth to reduce torsional forces even though they may have to be on a pontic.

To comply with this there may be a compromise in aesthetics. Figures 2 to 7 illustrate the case of lower central and lateral incisor and canine pontics retained by the first premolar abutments. The incisal edges are all of a similar length and shorter than the premolars to allow guidance to be taken up by the abutment teeth (first premolars) and the second premolars at the start of guidance and only progressively coming onto the canines (nearest the abutments) and then incisors at the end of the movement. It is known that bruxing forces are greatest at or near the intercuspal position and less towards the extremes of movement and edge-to-edge position.

By designing the occlusion in this way the forces of bruxism can be reduced. A prerequisite of this style of extensive bridgework is that the dentist should have control of the whole occlusion and both dentist and technician should con-

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TABLE 1: YEARS OF SERVICE OF VARIOUS LENGTH BRIDGES

Six Unit Canine to Canine	15.3 years
Two Unit Anterior Cantilever Two Unit Splint	14.9 years
Single Crown	9.1 years
Six units or More (Not Including Canine-to-Canine)	8.6 years