Bridge Designs (Case Report)

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Introduction

Skills of dentist and laboratory technician are very important in giving highly esthetic and functional prosthodontic results, but it is very important for both to know the most appropriate designs of bridges for every case.

In a case-based post-graduate course: 68% dentists suggested designs that would have carried a very high risk of failure. The frequently asked question, “What about those who don’t attend continuing education courses?” is worth highlighting again.

Unfortunately, it is not uncommon to find cases of bridge work with unfavorable or even mistaken designs of crown and bridge work. In this case, mistaken design of old bridge case was found, with poor esthetic, functional and biologic results. In this case, mistaken design of old bridge case was found, with poor esthetic, functional and biologic results. Correction of old treatment, full mouth rehabilitation and compromise treatment to correct anterior open bite was completed and will be presented in a case report below, followed by a discussion of some principles in prosthodontic and restorative dental treatments, including:
- Ideal or compromise treatment plan
- Tongue thrusting and anterior open bite
- Ant’s law
- Pier abutment
- Post and core choices.

Case report

An 18-year-old female patient with heart problems (cardiologist advised using antibiotic prophylaxis before each invasive dental treatment) presented to the Dental Department in North West Armed Forces Hospital in Tabuk asking for dental treatment.

She had a history of multiple visits to a private clinic where she had anterior bridge constructed. Her chief complaint at that time was pain in most of the teeth and bleeding gum in upper anterior area. And most important for her was the poor appearance of her teeth.

Oral examination revealed poor oral hygiene, multiple caries and some retained roots, in addition to an anterior bridge where one could clearly see severe gingivitis around the overhanging margins, poor esthetics in shade and contours. In addition, the anatomy of the teeth with anterior open bite which was not corrected neither orthodontically nor prosthodontically resulted in still anterior open bite and tongue thrusting (Fig. 1).

Treatment

Treatment was done in stages according to a suggested treatment plan.

Stage 1: Treatment for the urgent complains was accomplished by simple tooth extraction.

Proceeding with the treatment required that the patient improves her oral hygiene, so oral hygiene instructions were given to her with dietary advice, and she was referred to an oral hygienist for full mouth scaling and polishing. She was also given appointments for continuing treatment according to the instructions regarding antibiotic prophylaxis (i.e. minimum 2 weeks time between appointments).

Restorative work and extractions of the indicated teeth were completed in the following appointments. (Extraction of teeth 25, 36, 46, 44; root canal treatment for teeth 13 and 23; and fillings for the other carious teeth).

Patient showed improvement of her oral hygiene during treatment, but did not show up for the next 2 years. Then she came back again asking for correction of her front teeth appearance, and also for replacement of the missed posterior teeth (age 20, social reasons, marriage time). Patient was still keeping good oral hygiene as much as she could (Fig. 2).

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Stage 2: Removal of old anterior bridge by crown and bridge removal appliance was done to reassess the abutment teeth. The condition of teeth was very poor, with recurrent caries in tooth 12 due to leakage (Fig. 3). Radiographs showed substandard root canal treatment in teeth 12, 11 and 21 (Fig. 4).

Endodontic re-treatment was done for the three abutment teeth and build ups made using prefabricated passive parallel posts and composite build up. Preparation for crowning and bridge was done to replace missing tooth 22 (Fig. 5, 6 and 7).

Porcelain fused to metal crowns on teeth 13, 12 and 11 and a three-unit bridge on 21, 22 and 23 were made and cemented, as well as correcting the anterior open bite using an anterior edge to edge relation as a compromise faster treatment of open bite (Fig. 8a, 8b, 8c).

Posterior teeth: a three-unit bridge of porcelain fused to metal was made to replace missing tooth 36 while in the lower right side a four-unit bridge was cemented, replacing missing teeth 46 and 44 where 44 pontic was cantilevered (45 is pier abutment) (Fig. 9, 10).

Discussion

What is an ideal treatment plan? A course of action might be considered ‘ideal’ if it was best when all of the circumstances that prevail have been taken into consideration. To be more specific, a treatment plan would be considered ideal if it achieves the best possible long-term outcomes for the patient, while addressing all patient concerns and active problems, with the minimum necessary intervention.

The dentist should decide what is the best treatment option to recommend, based on the current evidence base rather than on personal preferences or bias. What is the best available may differ from the best he can provide, and it may also differ from what is covered by third party payments. We have an obligation to offer referral where appropriate and to present patients with all reasonable options, not to prejudge what they are likely to be able to choose or can afford.

Overall circumstances may modify what is best, and the whole mouth must be considered rather than an individual tooth.

There are often situations when two or more very good options are available. In these circumstances, it is the dentist’s obligation to present all of these options.

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Factors that must be discussed for each option include:

• Likely longevity (this should be evidence-based)
• Cost
• Invasiveness/reversibility
• Success rates (again, evidence-based)
• Possible complications
• Time involved, both total treatment time and number of visits
• Influence on quality of life.

What compromises are acceptable?

It is not always possible for the patient to proceed with the recommended ideal option. This is most often because of costs but can also on occasion be due to a time factor or to the patient having a bias against recommended treatment (‘my friend had root canal treatment and still lost the tooth’). In most situations, there are reasonable alternatives to the recommended ideal. These should be considered to be acceptable compromise.

In this case, after consultation with orthodontist, and due to patient will (wants faster treatment) and to the condition of the anterior teeth (endodontically treated and crowned), and considering it is faster and easier to treat this case prosthodontically to solve the problem of anterior open bite, a prosthetic option was chosen.

Regarding tongue thrusting

Some may say, as patient has tongue thrust habit, that this may cause her anterior teeth to move forward after correcting the anterior open bite prosthodontically, according to some studies. Patient swallows 1000 times per day, each swallow takes a little over one second. Accordingly, tongue thrust forces only happens about 20 min. daily, and for teeth to move, a force must be applied for at least 8 to 14 hours per day. Since patients use their
tongue to get anterior seal in cases of anterior open bite, when this anterior seal is achieved by correcting the anterior open bite, this habit will break. Another study made by Dworkin JP and Culatta RA showed no significant differences in tongue strength among 3 groups of normal speaking children, children with frontalis lisping, anterior tongue thrusting, and open bite malocclusion, and a control group, so tongue strengthening exercises recommended by some authors for correction of tongue thrust may be superfluous.(4) A 14-month follow-up of this case showed no movement of teeth (Fig. 9, 10).

**Double and triple abutments**

Many textbooks of fixed bridge work still recommend multiple abutments as means of tying in the prostheses. While multiple abutments may also be recommended at times by those who adhere to Ante’s law, double abutments are also described as a means of increasing retention, but their use on these grounds is mistaken:

1. Fixed prostheses are much more at risk from failure due to inadequate resistance, i.e. being twisted or torqued off the teeth. Double abutments increase retention but decrease resistance thereby increasing the risk of failure of the bridge through loss of cementation of the secondary retainer as the primary abutment becomes a fulcrum.
2. There is also no evidence indicating that the use of a second abutment will protect a weakened one.
3. Ante’s law was suggested when the causes of periodontal disease were largely unknown and occlusal understanding was based around concepts derived from complete denture prosthodontics.(1)

Consequently, it is always better to use separate crowns rather than fusing crowns interproximally (except in few circumstances such as splinting, where the work should be carried carefully) due to periodontal (flossing), occlusal, retentive and preventive reasons. Sorenson and Martinoff(5) showed:

- 94.8% success rate for single unit crowns
- 89.2% for FPD abutments.
- 77.4% for removable PD abutments (both distal extension and tooth borne designs).

In this case report, old bridge didn’t even follow Ant’s law. So separate crowns were made on teeth 13, 12 and 11 while a three-unit bridge was constructed at teeth 21 and 23 replacing missing 22. As cantilever bridges on root canal treated teeth is contraindicated, Testori et al(6) did not recommend anchoring a cantilever bridge on abutment that was root canal treated and fitted with a post. And using extra coronal attachment on individual root canal treated teeth will put them at risk.

Another study found in a 3-year retrospective study that failure rate for root canal treated teeth used as abutments for FPD and RPD was over double that for teeth not used as abutments.(7)

Post and core are indicated when root canal treated teeth are badly destroyed so it was indicated for teeth 12, 11 and 21 in this case, although cast post and core systems in anterior teeth are preferred on prefabricated posts and composite build up in many references.(8) Still, some prefer using prefabricated (passive parallel post designs) posts in anterior teeth(9) for the following reasons:

- Prefabricated parallel posts have been proven to have greater clinical success than custom cast posts in several studies.
- Additional expenses and extra appointments are required to fabricate cast posts.
So in this case, prefabricated posts were used in anterior teeth (parapost system) and composite build up.

Pier abutment

Pier — The intermediate or middle abutment in a fixed partial denture of three abutments. In a fixed partial, extending from cuspid to second molar with the second bicuspid present, the second bicuspid would be the pier.

Tooth number 45 was a pier abutment in this case. Normally rigid connectors between pontics and retainers are the preferred way of fabricating most of FPD. Rigid connectors will provide desirable strength and stability to the prosthesis.

Design of bridge in case of pier abutment:
1. Use a non-rigid dovetail connector between the molar pontic and the second premolar.
Placement of the keyway on the mesial side of the pier abutment will cause the key to be unseated during its mesial movements.\(^{(10)}\)
2. Where the periodontal support is inadequate, a much simpler approach would be to cantilever the first premolar pontic.

Conclusion
This case report aimed to show the importance of the design of the bridge. Any crown or bridge work and any treatment plan either ideal or compromise should always be evidence-based to get a better prognosis.

References