



Matthew J Gahan

Peter J Nixon, Stephen Robinson and Martin F W-Y Chan

The Ovate Pontic for Fixed Bridgework

Abstract: The provision of fixed prosthodontic restorations that meets the patient's functional and aesthetic demands can be challenging, especially in the anterior maxilla. It requires close communication with the technician and knowledge of the available options. This article will outline the options for pontic design and focus on the ovate pontic, which has the potential to provide the most aesthetic outcome. This should equip the practitioner with the knowledge as to which pontic to prescribe if such a challenge arises.

Clinical Relevance: Fixed bridgework is a commonly prescribed prosthesis for the replacement of missing teeth. In order for this to be provided successfully, the practitioner should have a working knowledge of the available options for pontic design. This is especially important in cases where aesthetic demands are high.

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A pontic should be designed to provide a functional and aesthetic replacement for a missing tooth or teeth. The location of the missing tooth, either anteriorly or posteriorly, will determine which of these factors has the greater emphasis in an individual situation. Providing an aesthetic anterior bridge may be challenging with respect to giving the pontic a natural appearance. Several factors need to be addressed successfully. These include the

size, shape, shade and position of the pontic, as well as the emergence profile from the soft tissues.¹ In order to mimic the appearance of a natural tooth, the pontic should appear to emerge from the gingivae and support the buccal/labial soft tissue as well as the adjacent papillae. The proximity of the pontic to the mucosa requires that the design should be cleansable and compatible with plaque control and periodontal health. The emergence profile of the pontic is especially important if the bridge is planned in the anterior maxilla and the patient has a high smile line. In many cases, the commonly used pontic designs may not adequately address all the aesthetic challenges.

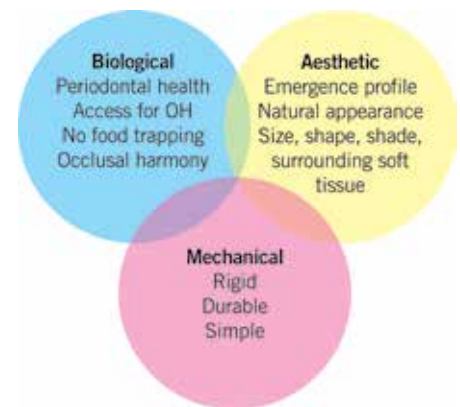


Figure 1. Properties of an ideal pontic.

accumulation, along with gingival and mucosal inflammation.⁴⁻⁶ The elements in crown and bridge design that have been recommended to reduce these risks are supragingival margins, good marginal fit, correct emergence profile, smooth pontic surface, embrasure spaces, minimal contact and pressure on the underlying mucosa.⁷⁻⁹ Minimal pontic contact and pressure on the underlying mucosa have been recommended as important design features for bridge pontics to avoid plaque accumulation and mucosal ulceration.¹⁰

Matthew J Gahan, BChD, MDSc, MFDS RCS(Edin) FDS(Rest Dent) RCS(Ed), Consultant in Restorative Dentistry, York Teaching Hospital NHS Foundation Trust, **Peter J Nixon**, BChD, MDSc, MFDS RCS(Edin) FDS(Rest Dent) RCS(Ed), Consultant in Restorative Dentistry, Leeds Dental Institute, **Stephen Robinson**, BChD, MDSc, MFD RCSI FDS(Rest Dent) RCSI, Senior Lecturer, University of Queensland/Senior Dentist, Brisbane Dental Hospital and **Martin F W-Y Chan**, BDS, MDSc, MRD RCS(Edin), DRD RCS(Edin), FDS(Rest Dent) RCPS(Glas), Consultant in Restorative Dentistry, Leeds Dental Institute, Leeds, UK.

Periodontal considerations

It is clear from the dental literature that plaque is the major risk factor in the development of caries and periodontal disease.^{2,3} A fixed prosthesis has the potential to increase plaque accumulation and decrease access for oral hygiene and may increase the risk of caries and periodontal disease. Bridge pontics and subgingival margins of bridge retainers are associated with increased dental plaque



Figure 2. A hygienic pontic that has been in service for over 20 years – note the plaque deposits at the distal abutment.

Bridgework pontic options

In situations where a bridge is planned there are a number of options regarding the pontic design. It is useful to consider the pontic design in terms of mechanical, biological and aesthetic demands. The ideal properties of a bridge pontic are indicated in Figure 1. The options that have previously been suggested for a pontic design are:

- The hygienic pontic;
- The ridge lap/saddle;
- The modified ridge lap;
- The ovate pontic.

Hygienic pontic

The hygienic pontic (also known as the ‘wash-through’ pontic) is so called as it was believed that this design offered the most appropriate method of avoiding mucosal and gingival inflammation. It was designed to provide complete clearance of the tissues. Despite its name, it can provide a significant challenge for patients as the space can accumulate significant amounts of food debris and plaque. The other disadvantage is that it does not provide an aesthetic replacement for a tooth and its use is now largely historical. Anecdotally, provision of this design in the posterior mandible did appear to provide some success. Figure 2 shows a posterior hygienic pontic that has been in service for over 20 years.

Ridge lap/saddle pontic

This pontic design sits over the alveolar ridge in intimate contact with the mucosa (Figure 3a) and provides a realistic emergence profile with good aesthetics. However, the need for a pontic to be

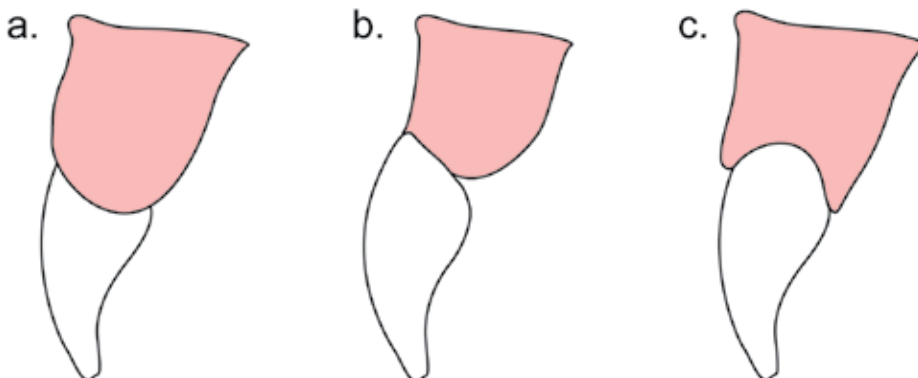


Figure 3. The three most commonly used anterior pontic options: (a) ridge lap/saddle; (b) modified ridge lap and (c) ovate pontic.

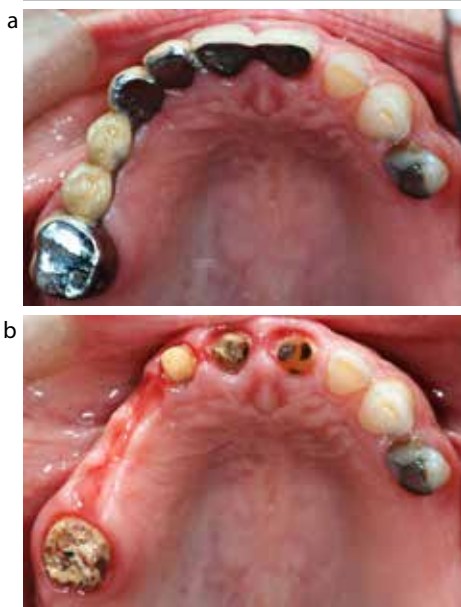


Figure 4 (a, b) Inflamed and ulcerated mucosa associated with a failing bridge with saddle pontics.

compatible with the continuing periodontal health of its surrounding structures is paramount. The large concavity of the pontic cannot be cleansed by flossing. This design may lead to plaque accumulation and mucosal ulceration (Figure 4a, b). It is for this reason that the ridge lap pontic is now largely obsolete and is not recommended for bridgework.

Modified ridge lap

The modified ridge lap pontic is intended to incorporate features that are more hygienic and address the problems associated with the ridge lap/saddle pontic. Its use was advocated by Stein⁸



Figure 5. Poor aesthetics produced by a modified ridge lap pontic.

who investigated the effects of different pontic designs on the surrounding mucosa and found that the modified ridge lap design was compatible with aesthetics and mucosal health. It has a minimal point contact with the labial/buccal mucosa and was recommended ideally to exert no pressure on the mucosa (Figure 3b). The modified ridge lap has become one of the most popular pontic designs and is still commonly requested. The advantages of the modified ridge lap are:

- Convex surface is readily accessible to cleaning with floss;
- Good aesthetics;
- Mechanically durable.

However, in certain circumstances the emergence profile of this design can be less than ideal, leading to aesthetic shortcomings (Figure 5). An alternative approach may be required when aesthetic demands are high, such as in the anterior maxilla in a patient with a high smile line and when alternatives, such as implant provision, are not possible.

Ovate pontic

Definition

The ovate pontic¹¹ is an



Figure 6. Indicating the convex surface of the ovate pontic with the maximum height slightly buccally positioned.



Figure 8. (a–d) Ovate pontic site development with electrosurgery to prepare the site prior to impression taking for a RRB with an ovate pontic replacing the UR4.

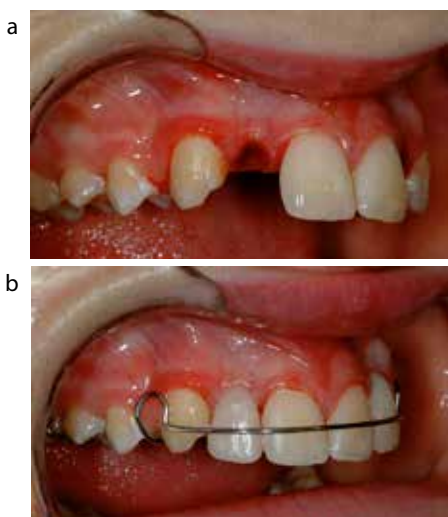


Figure 7. (a, b) Ovate pontic site development with rotary instruments prior to impression taking and maintained with a Hawley retainer.

approach for aesthetically demanding anterior bridgework. An ovate pontic design can be defined as one which has an increased amount of mucosal contact and applies light pressure to the underlying mucosa in an attempt to improve aesthetics,^{11,12} (Figure 3c). This pontic design has been proposed to address the issue of emergence profile aesthetics. Use of the ovate pontic must be combined with effective oral hygiene procedures so that the mucosal contact and minimal tissue pressure do not become a cause for concern.

History

In the early twentieth century, pontics were designed with extensive

infections; it consequently fell out of favour.

In the mid-1960s, Stein's work confirmed early clinical experience, advocating that mucosal contact and pressure should be avoided.⁸ The modified ridge lap pontic subsequently became the design of choice. However, once the importance of plaque control in maintaining the adjacent mucosal health was appreciated, clinicians began to revisit and modify pontic designs. The modern, hygienic development of the porcelain root extension design is the ovate pontic.

Periodontal considerations

Research into the periodontal impact of restorative prostheses highlighted the importance of plaque control in maintaining periodontal and mucosal health. Silness *et al*¹⁴ investigated the effects of oral hygiene procedures (interdental brushes and dental floss) on the mucosal and gingival health associated with bridge pontics. This research showed that mucosal and gingival health could be maintained despite the contact and pressure of the pontic if regular, effective oral hygiene procedures were conducted. The key factors for the biological success of any pontic design are in the access for adequate plaque control and the efficacy with which this can be conducted. The histological effects of the mucosal contact have been investigated by Zitzmann *et al*¹⁵ who biopsied comparative sites of mucosa under ovate pontics after 12 months. It was reported that, although there were increased numbers of inflammatory cells and a thinning of the keratinized layer, clinical signs of inflammation were not common. They concluded that the ovate pontic design, if correctly cleansed with bridge floss, was compatible with oral health. The type of material in contact with the mucosa is not critical as long as it is highly polished and the entire pontic's mucosal surface is amenable to cleaning.¹⁶ If good oral hygiene is maintained, provisional restorative materials can be used to develop the pontic site and soft tissue form without adverse inflammatory changes in the mucosa.¹⁷

mucosal contact and bridges had porcelain root pontics extending into extraction sockets or surgically prepared sites.¹³ Authors advocated that the porcelain root pontics should extend a short distance into the socket so that the mucosa healed and epithelialized underneath the porcelain roots. However, this technique was associated with poor oral hygiene, inflammation, mucosal swelling and

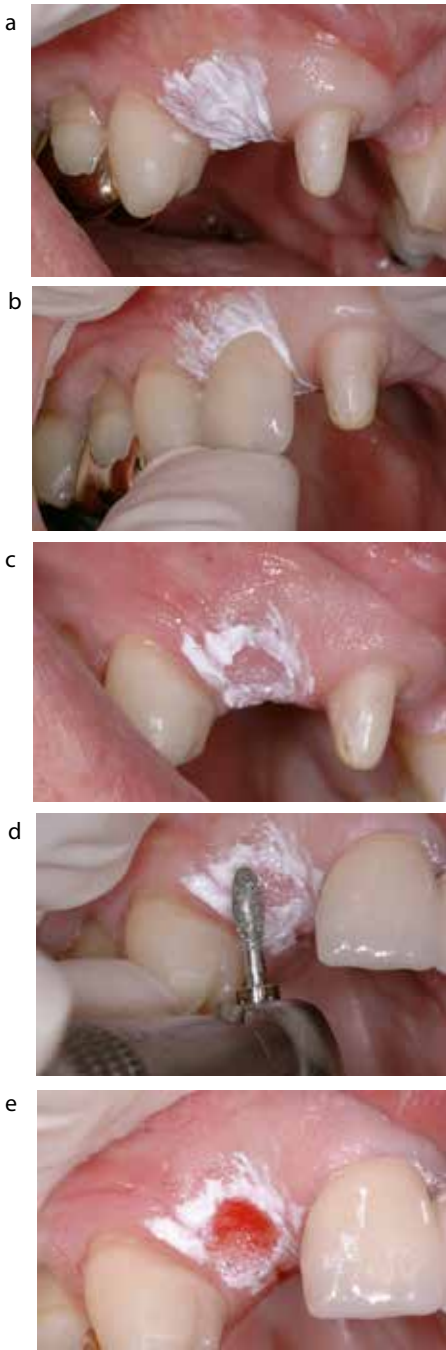


Figure 9. (a–e) Ovate pontic site development with rotary instruments at the time of fitting the restoration.

Clinical considerations

To optimize plaque control, the ovate pontic must have a highly polished, convex mucosal surface that will aid the passage of floss, allowing it to contact the entire under surface of the pontic. The pontic should be designed so that the



Figure 10. (a–j) A case illustrating the use of a resin-bonded bridge (RBB) with an ovate pontic to replace a missing UR2. (a) Pre-operative clinical situation. (b) Periodontal probe measuring mucosal thickness and elasticity. (c) Ovate pontic site preparation with electro-surgery. (d) Pontic site recorded in impression. (e) Provisional restoration. (f) RBB with ovate pontic; note seating arm to aid cementation. (g–i) Clinical views of the RBB showing ovate pontic emerging from the mucosa. (j) Patient smiling showing the aesthetic challenge of a high smile line (RBB UR2 and diminutive UL2 restored with composite resin).

convex surface extends into the mucosa by 1–2 mm, depending on the thickness and visco-elastic nature of the mucosa

(Figure 6). This mucosal depth creates the appearance of the pontic emerging from the gingival tissues and allows a more

realistic tooth replacement. The other reported advantage is that the papillae may be supported and maintained, when used as an immediate replacement, and may reduce the occurrence of 'black triangles' which result from the recession of the interdental papillae. A summary of the advantages of the ovate pontic are:

- Convex surface to aid the passage of floss;
- Excellent aesthetics, especially emergence profile;
- Papillae supported and maintained;
- Reduce the presence of black triangles;
- Mechanically durable.

In order for the ovate pontic to be successful, there must be sufficient height and width of alveolar ridge. The early papers reporting this technique advocated surgical augmentation of the pontic site with roll flaps and connective tissue grafts to enhance the emergence profile.^{11,12,18}

This pontic design is ideal for the anterior maxilla, especially if there is a high smile line or when aesthetic demands are high.¹⁹

The development of the recipient sites can involve gingivoplasty or the use of a long-term provisional restoration. The gingivoplasty can be conducted by either the use of high-speed rotary instruments or electrosurgery (Figures 7, 8). Before the site is developed it should be anaesthetized so that the depth and visco-elastic nature of the mucosa can be assessed by bone sounding with a periodontal probe. At least 1 mm of mucosa should be maintained over the underlying alveolar bone. Another important consideration is the distance from the contact point to the underlying crestal bone. If this distance is 5 mm or less, the presence of a papilla is more predictable.²⁰ This requires bone sounding and clear communication to the technician. In cases where there is insufficient mucosal depth, the edentulous space can be grafted prior to restoration to increase tissue depth.^{11,18}

Electrosurgery should be used with caution, as prolonged tissue contact will cause excessive tissue loss, especially if the mucosa is thin. The timing of the gingivoplasty can also vary. It can be prior to impression taking or immediately prior to the fitting of the definitive restoration. If the former is chosen, a suitable provisional must be constructed to maintain the shape created. The provisional restoration

needs to be highly polished, convex and apply light pressure to the area but still allow the passage of floss. It is possible to relin an existing denture or provide a suitably constructed Essix retainer.

Following gingivoplasty, the mucosa heals by secondary intention over a period of weeks. With regard to the use of a long-term provisional restoration, the authors of this article would advise that 3 months is a suitable period, but there is little evidence for this.^{21,22} The advantages of preparing the recipient site prior to the impression stage are that the clinician can assess the mucosal depth and degree of viscoelastic compression of the tissue. It also gives the clinician more control over the emergence profile of the restoration. If the clinician develops the site at the time of fitting the bridge, the laboratory technician has to estimate the thickness and compression of the mucosa, which is not ideal.

In cases where the pontic site is to be developed at the time of fitting the prosthesis, the technician has to prepare the cast in order to provide sufficient space for the pontic. If a diagnostic wax-up has been used, the position of the pontic and the emergence profile will have been agreed prior to construction of the restoration. A silicone index of this agreed position will aid the technician in determining the correct emergence profile of the pontic. Prior to fitting the bridge, the clinician has to prepare the recipient site to receive the pontic. To guide the process, the clinician can use pressure indicating paste on the pontic which, when seated, will indicate where the mucosal tissue should be removed (Figure 9 a–e).

It is, however, preferable that the ovate pontic position and emergence profile remain a clinical decision. This is in respect of detailed guidance which should be given to the technician, with the site recorded in the impression material. Figure 10 provides a pictorial guide to providing a resin-bonded bridge with an ovate pontic to replace a lateral incisor.

Once the decision has been made to provide a bridge, the ideal situation for excellent aesthetics is where an unrestorable tooth is carefully extracted to preserve the buccal bone and an immediate removable partial denture or provisional bridge is constructed prior to provision of a definitive fixed bridge. The

socket fit design of the denture or bridge has a convex acrylic surface that extends 1–2 mm below the gingival margin. During the healing process, this can maintain the gingival architecture and help to reduce the occurrence of 'black triangles'.²¹ Once the healing is complete, the definitive fixed restoration can be constructed and the pontic fitted to the cast. It should have the optimal emergence profile to mimic a natural tooth.

Summary

In summary, where sufficient hard and soft tissues are present, an ovate pontic can provide highly aesthetic results to create a natural looking tooth replacement for anterior bridgework. The technique is simple to use and is readily applied to the practice setting. The technique offers the most advantageous result in the anterior maxilla, in a motivated patient with a high smile line. For a successful aesthetic outcome good communication between the clinician and technician is required and, in the long term, a good standard of oral hygiene is essential from the patient.

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