

Technique Tips

Dental extraction forceps: choose wisely

Dent Update 2023; 50: 147-149

Dental extractions are the most common surgical intervention and are an essential skill for general dental practitioners. Forceps have existed for centuries and their design has varied little in this time. However, subtle differences between forceps can have a significant influence on the success of dental extractions. This article reviews conventional dental forcep anatomy and discusses the factors of material, handles, hinges and beaks, which need consideration when choosing forceps for dental extractions.

Forceps have been used to extract teeth for centuries. The word 'forcep' is derived from the terms 'formus' meaning 'warm' and '-cep' meaning 'taker', relating to their original use of holding hot food on a stove. The effectiveness of a good dental forcep must not be underestimated and appropriate selection can significantly influence whether a tooth is removed intact during an extraction procedure.

Contemporary forcep designs, such as physics forceps, have yet to be proven as being less traumatic for dental extractions¹ and so, conventional dental forceps are still used widely for extractions of teeth and roots in humans. This article reviews conventional dental forcep anatomy and discusses material, handles, hinges and beaks, factors that need consideration when choosing forceps for dental extractions.

Forcep anatomy

Basic dental extraction forcep anatomy consists of handles, a hinge and beaks



Figure 1. Conventional dental forceps anatomy.

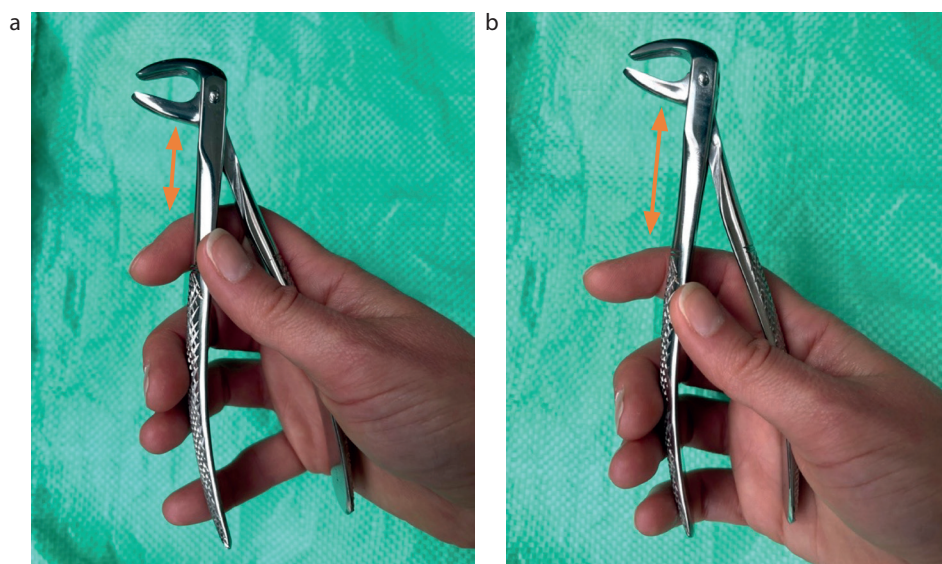


Figure 2. (a) The grip is closer to the hinge, while in (b) the grip is further from the hinge.

(Figure 1). Modern forceps will have each of these components and are aligned with International Organisation for Standardization (ISO) standards and outline requirements for forcep material, design and intended function for safe use.²

Material

The ISO requirements dictate that dental forceps must be manufactured from Grade B or C stainless steel, being strong enough to withstand the forces required for the extraction of teeth and also having

Carla Fleming, BDS, MJDF RCS (Eng), Dip Con Sed, Consultant Senior Lecturer in Oral Surgery, Bristol Dental Hospital. **Laura Collins**, BDS, MJDF RCS (Eng), Dip TLHP, Speciality Registrar in Oral Surgery, Royal London Hospital. **Christopher Bell**, BDS, MSc, FDSRCS (Eng), Associate Specialist and Honorary Senior Lecturer in Oral and Maxillofacial Surgery, Bristol Dental Hospital. **Mark Gormley**, BDS (Hons), MMed, MSt, MFDS, MOral Surg, FHEA FDS(OS), RCS Ed, Consultant Senior Lecturer in Oral Surgery, Bristol Dental Hospital. email: laura.collins4@nhs.net

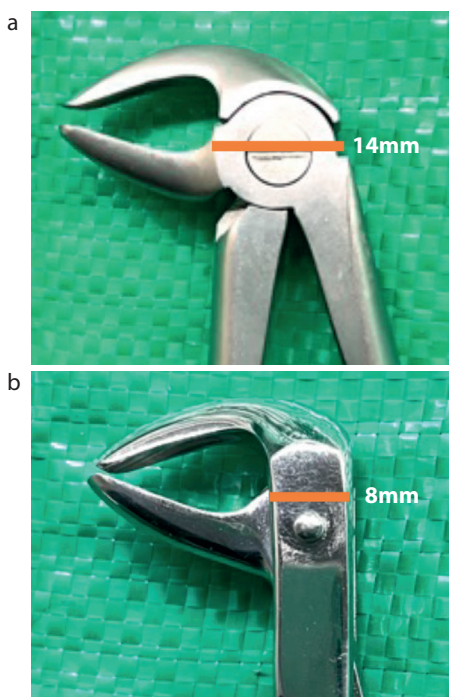


Figure 3. (a) Circular hinge joint. (b) Pin hinge joint.

excellent corrosion resistance.² There is interest in other materials, such as carbon-reinforced polyamide;³ however, such instruments are not currently approved or available for clinical use, but may be a choice in the future.

Handles

Dental extraction forceps are essentially levers that can be used to exert a large force over a small distance at one end by exerting only a small force over a greater distance at the other end. This first class lever principle is described and illustrated by Rehal and Shoker.⁴

A firm grip of dental forcep handles and the tooth root is necessary to ensure that force is directed through the tooth itself rather than the forcep blades slipping on the root surface. For dental practitioners, a 'power grip', described by Napier⁵ is used (Figure 2). When the long handles of dental forceps are squeezed with a power grip by the operator, force is applied through the fulcrum (hinge) to the opposite shorter ends (beaks).

If the position of the grip on the handles is moved away from the fulcrum, as shown in Figure 2b, then the force of grip at the beaks will be greater. This small movement of the operating hand away from the hinge can

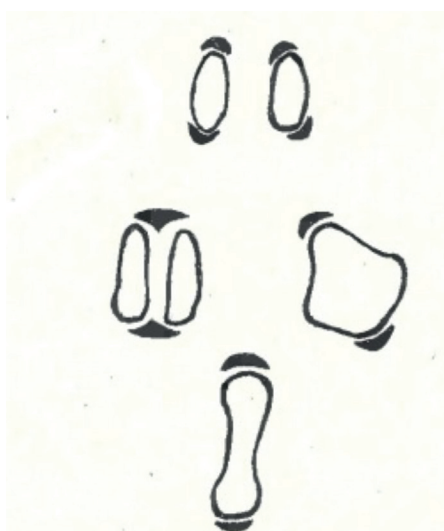


Figure 4. Illustration adapted from Ashcroft and Pawsey⁶ demonstrating 'best fit' position of the forcep beaks for incisors, molars and premolars.

significantly assist in gripping the root of a tooth and translating hand movements into tooth movements, thereby reducing the risk of unintended tooth fracture. This is particularly important when a forcep beak is an imperfect fit around the root of the tooth for removal, which can lead to slippage of the forceps blades on the dentine.

Straight forcep handles, which facilitate an effective grip, are needed for the instrument to be moved comfortably in the operator's hand (Figure 2). Curved handled forceps can hinder the movement within an operator's hand, and too-smooth or too-narrow handles can compromise an effective grip. Good assessment of forcep handles is important to use the instrument as intended.

Hinges

Hinges on dental extraction forceps are usually a 'circular joint' or 'pin joint' (Figure 3). There is no evidence available to assess longevity or effectiveness of use with either joint and therefore either is acceptable. Consideration, however, should be made to access in the posterior part of the oral cavity with lower molar forceps because those with a circular joint (14 mm in Figure 3a) can be bulkier than those with a pin joint (8 mm in Figure 3b) and therefore placing the instrument vertically on posterior molar teeth can be challenging in patients with limited access.

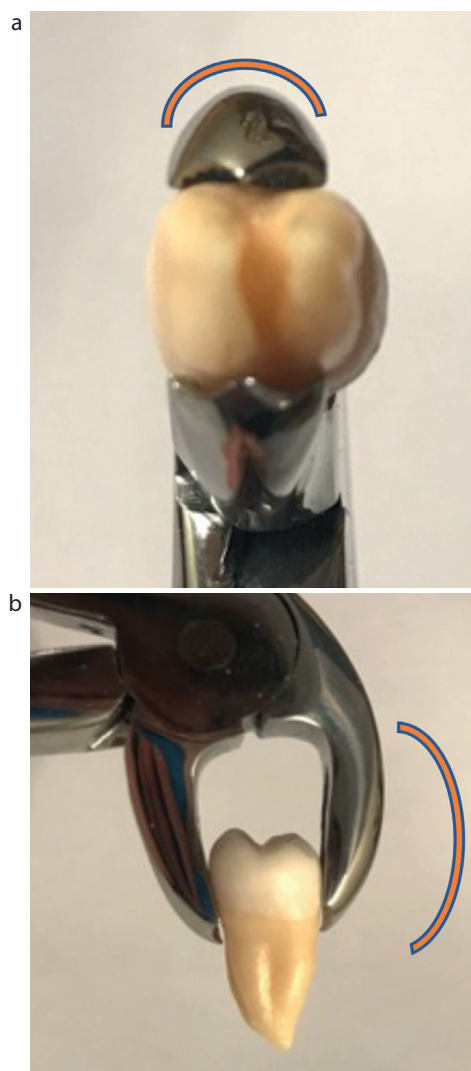


Figure 5. (a) The *lateral* and (b) *longitudinal* curvature of forcep beaks.

Beaks

Forcep beaks are designed to fit around the coronal part of tooth roots; however, normal human anatomical variation means there will rarely be a perfect fit with universally manufactured beaks. In 1957, Ashcroft and Pawsey presented best-fit positions of forcep beaks on dental roots with regard to tooth morphology, and this is helpful when considering a 'best-fit' scenario⁶ (Figure 4).

In light of this, it is helpful to ask two key questions when identifying a 'best fit' for dental forcep beaks:

- Do the beaks curve *laterally* such that a significant part of the root is in contact with them (Figure 5a)?
- Do the beaks curve *longitudinally* such that the blades are contacting the root rather than the crown of the tooth (Figure 5b)?

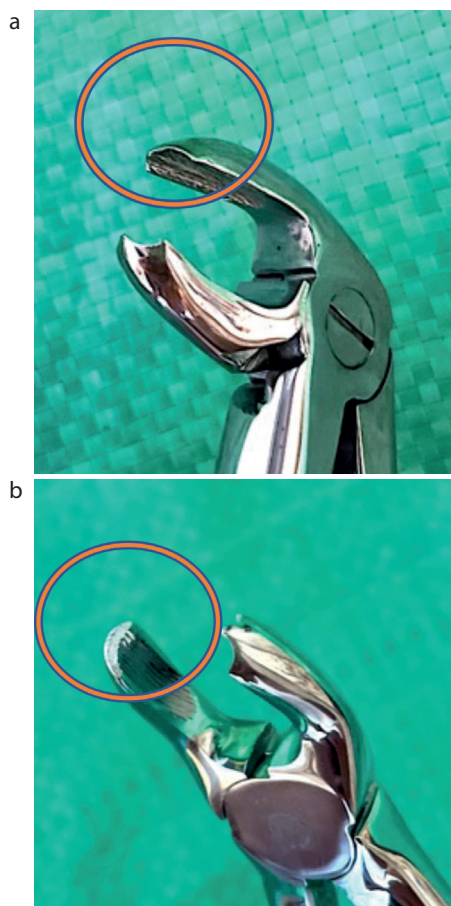


Figure 6. Example of (a) a sharp and (b) a blunt forcep beak.

If the forceps beaks curve in ways that fit the roots well, then the tooth will be less likely to fracture. With a poor fit, usually due to the beaks being too straight in design as in Figure 5b, the crown or apical part of the root is more likely to fracture when rotational and lateral forces are applied through the forceps.

In addition to the 'best fit' questions, a critical eye should be cast upon the sharpness of the beak tip. The periodontal ligament around teeth is about 0.2 mm wide⁷ and sharp, gently tapered beak tips facilitate extension apically down the periodontal ligament to grip the dentine on the root of the tooth (Figure 6a). Flattened, thick-edged blades will not fit into the narrow periodontal ligament space as easily, and will therefore grip too coronally on the root or indeed, inadvertently grip the crown (Figure 6b), leading to potential tooth fracture.

Maintenance is needed to preserve sharpness to maximize effectiveness of a dental forcep and individual manufacturers can offer specific advice for individual products.

Summary

Table 1 summarizes the aforementioned factors that should be considered when choosing a dental extraction forcep.

We hope this article helps dental surgeons and dental therapists to choose dental extraction forceps wisely. Alongside appropriate hand movements and direction of force, a few moments with a critical eye on a dental forcep can reduce the risk of tooth fracture during an extraction procedure and promote the extraction of intact roots and teeth for the benefit of both operating clinicians and their patients.

Compliance with Ethical Standards

Conflict of Interest: The authors declare that they have no conflict of interest.

Informed Consent: Informed consent was obtained from all individual participants included in the article.

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Factor	Considerations	Reasons
Material	Metal only at present – may change in future	Strength to accept forces of movement and give proprioceptive feedback in the operating hand
Handles	Shape and grip	Straight handles to fit well in the palm of the hand and a gripping surface that enables a tight 'power' grip to maximize effective grip on the tooth root, in line with 'law of the levers'
Hinges	Design	Circular joints can increase forcep bulk in posterior oral cavity, which may compromise placement on a tooth root where access is challenging
Beaks	Shape and sharpness	'Best fit' lateral and longitudinal curvatures should grasp the tooth root and avoid touching the crown. Sharp beak tips are needed to penetrate the periodontal ligament space (0.2 mm)

Table 1. Summary of the factors to be considered when choosing a dental extraction forcep.