

Crunch time: approaches to bite abnormalities and malocclusions

PICTURE the scene. Mrs Jones and her puppy, Zak, are in for the second puppy vaccination visit. She mentions that he appears a little uncomfortable when she touches his muzzle.

A quick look confirms that both his lower deciduous canine teeth appear to be misaligned and hitting the hard palate. Closing his mouth leads to the puppy wriggling and crying.

So, what to do? At this point it's easy to say it will all come right on the night – but will it? The bad news is that it probably won't. Points to discuss with the client at this time include:

- what to do now;

NORMAN JOHNSTON

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examines common canine bite disorders, and the ethical concerns surrounding their treatment

- what to do when the permanent teeth erupt;
- whether to contact the breeder; and
- ethics of treatment.

Small animal practitioners will realise that problems of bite and malocclusion are relatively common. Some breeds are more affected and most cases are presented early in their life.

Sometimes, owners are una-

ware or unconcerned and, other times, an owner with showing and breeding ambitions for the pup may be highly concerned.

The practitioner has to present an opinion and act in the interest of the patient and, secondarily, the client.

Normal bites

In dogs, the normal occlusal pattern is termed orthognathism (Figure 1). Problems exist commonly in dogs mainly due to great variation in skull type within the species. There are three basic skull types:

- dolicocephalic – long, narrow faces (for example, rough collie or greyhound);
- mesaticephalic – “normal” type face (German shepherd, Siberian husky); and

- brachycephalic – short, broad faces (boxer, bulldog and pug).

All adult dogs are genetically programmed to have 42 adult teeth. The reduction in length of the facial profile in small, short-faced breeds will lead to crowding of teeth at the very least, with more painful and disfiguring defects in more severe cases.

The normal points to look for when assessing dog bite are:

- The incisors should be in scissor bite. The upper incisors should overlap the lower incisors. The incisal edges of the lower incisors should occlude at, or near, the cingulum ridge on the palatal surface of the upper incisors.
- The lower canines should fit neatly into the diastema space between the upper canines and corner incisors when the mouth is closed. Ideally, the lower canines should touch neither upper tooth.
- The premolars should form “shear mouth”, whereby the tips of the crowns of the mandibular



Figure 6. Class three malocclusion, or undershot jaw.

premolars should point directly into the interproximal spaces between the premolars on the upper jaw, and vice versa. The upper fourth premolar (carnassial) should be lateral/buccal to the lower first molar.

- The skull should be symmetrical in the sagittal plane.

Any deviation from this is a deviation from the normal. The degree of deviation and the direction – ie, forward or rearward shift of the mandible – is the determining factor for overshot or undershot bites.

Bite classification

- **Class zero or orthoclusion**
This is a normal bite for a dog as per the criteria listed above.

- **Class one malocclusion/ neutroclusion**

In these cases, the overall relationship is correct relative to upper and lower jaws, but the line of occlusion is incorrect due to one or more teeth being out of alignment, rotated or changed in some way (Figures 2 and 3).

Common examples include persistent deciduous teeth, linguo-displaced mandibular canine teeth, rostrally-displaced (“lance”) upper canine teeth, supernumerary teeth, and rotated or crowded teeth.

- **Class two malocclusion/ distoclusion**

In this situation, some or all of the mandibular teeth are distal in their relationship with the maxillary teeth. In effect, this refers to a short mandible and a relatively long maxilla and is often called an overshot jaw (Figures 4 and 5).

This is not normal in any breed, but is seen in a variety of dogs. It is reported to have an autosomal recessive mode of inheritance in long-haired dachshunds and German short-haired pointers. In most cases, this requires intervention due to abnormal contact between one or more teeth and soft tissues of the mouth.

- **Class three malocclusion/ mesioclusion**

These cases present with some or all of the mandibular teeth being mesial (rostral) in their relationship with their maxillary counterparts, with a long mandible and a relatively short maxilla.

Breeds such as Boston terriers, boxers and English bulldogs show this undershot jaw as a “normal” anatomical feature (Figure 6). These breeds often have overcrowded teeth due to lack of space, particularly in the maxilla, and develop early periodontal disease. Although this appearance is not normal, it



Figure 1. Normal dog bite presentation.



Figure 2. A seven-month-old Japanese spitz. Note the abnormal rostral position of the left upper canine.



Figure 3. A six-month-old sheltie with a rostrally-positioned right upper canine, plus lack of eruption.



Figure 4. A five-month-old bearded collie with mixed deciduous and permanent teeth. Note the short mandible relative to the maxilla, and the left lower (LL) permanent canine erupting lingual to the LL deciduous canine.



Figure 5. Side view of a similar class two malocclusion (“overshot jaw”) as presented in Figure 4. In both cases, the lower teeth will make abnormal and traumatic contact with the hard palate.

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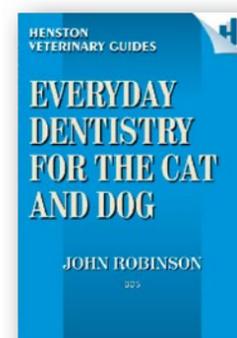
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TERMINOLOGY

- Gnathic: jaw (qualified by stating mandible or maxilla)
- Cephalic: skull
- Prognathic: a longer jaw relative to the opposite jaw (such as mandibular prognathism)
- Brachycephalic: a shortening of the skull relative to the lower jaw.



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rarely causes the severe contact problems associated with class two malocclusion.

Clinical importance

The veterinarian's primary responsibility is the relief of pain or discomfort. The second responsibility is counselling with regard to the possible inheritance of the condition.

An otherwise sound, well-cared-for dentition may show asymmetric abrasion or attrition. Problems may occur with mastication and TMJ function. Soft tissue trauma is a common sequel of malpositioned teeth and, finally, premature tooth loss may be caused by an increased liability to periodontitis as a result of crowding and rotation.

Aetiology and ethics

The primary problem facing the veterinarian in regard to aetiology is to decide whether the problem is inherited or acquired. If it is possible to determine this (assisted by the criteria outlined previously), it will allow the planning of treatment in a rational and ethical manner.

Frequently, more than one treatment is available for any one condition and it is critical that animals are not returned to the gene pool with treated, inherited orthodontic conditions that make their use as stud dogs more desirable.

Many breeds in the UK consistently run with high levels of common malocclusions. Some of these are clinical and clearly visible phenotypically.

Some may be marginally

important at the clinical level – ie, cause no functional problems to the animals – but, on a genotype level, still be significant to the breed as a whole.

The practitioner can easily face an ethical dilemma when faced by a client whose ambition for his or her pup is not matched by the genetic quality. Deciding whether a defect is inherited or acquired is critical to the ethical process. Referring the case can remove any awkwardness, conflict or pressure between the client and the practice.

Bad news is often accepted more readily from an independent expert whose role includes diagnosis and speculation about aetiology, as well as discussion of treatment options likely to be in the animal's best interest, and provision of a written report to both the client and referring practice.

Clients can use this report to obtain refunds from breeders who have charged high prices for substandard genetic material.

Interceptive orthodontics

This grand title often means simply taking action at the time of temporary dentition to avoid problems later.

The four jaw quadrants all grow independently and, in a rapidly-growing animal, this can commonly lead to temporary malocclusions.

The most common is a class two malocclusion, in which the mandibles grow slower than the maxillary quadrants, leading to the temporary lower canine teeth becoming caught distal

and lingual to their normal position – possibly in pits in the hard palate tissue.

This requires intervention for three reasons:

- To relieve the considerable pain of abnormal contact.
 - To remove the dental interlock between upper and lower jaws.
- In cases of normal upper and

continued overleaf



Figure 10. Rostral view of dog with class two bite and lingually-displaced lower canines. When this mouth closes, all the lower incisors and canines will make traumatic contact.

KEY POINTS

- The key to occlusion or bite type is seen in the relationship of the maxilla to the mandible in the premolar teeth. However, four separate sites should be examined for a bite appraisal:
 - The incisors should exhibit scissor bite.
 - The mandibular canine should fit neatly in the diastema between the upper corner incisor and maxillary canine, but should touch neither. It should be angled in a lingual buccal direction.
 - The upper PM1 should line up in a slot between the lower PM1 and PM2. The upper PM2 should line up in a slot between the lower PM2 and PM3 and so on caudally, producing a "pinking shear" effect.
 - The skull should be symmetrical in the sagittal plane.
- To safeguard the ethical position and to prevent treatments that are not in the best interest of the animal or the breed, owners should be made fully aware of the need for treatment and the various options available.

■ Often breeders firmly deny anything has ever been wrong with their dogs and maintain that the rest of the litter is normal. Your client may well have paid a tidy sum for the pup and will invariably not wish to return it. What are the options?

In most cases, a veterinary report with photographs is enough to leverage the return of most of the purchase price. Given that the pup's owners cannot breed or show their new acquisition, and may well have to fund expensive surgery just to allow normal function, this is the least the breeder can do.

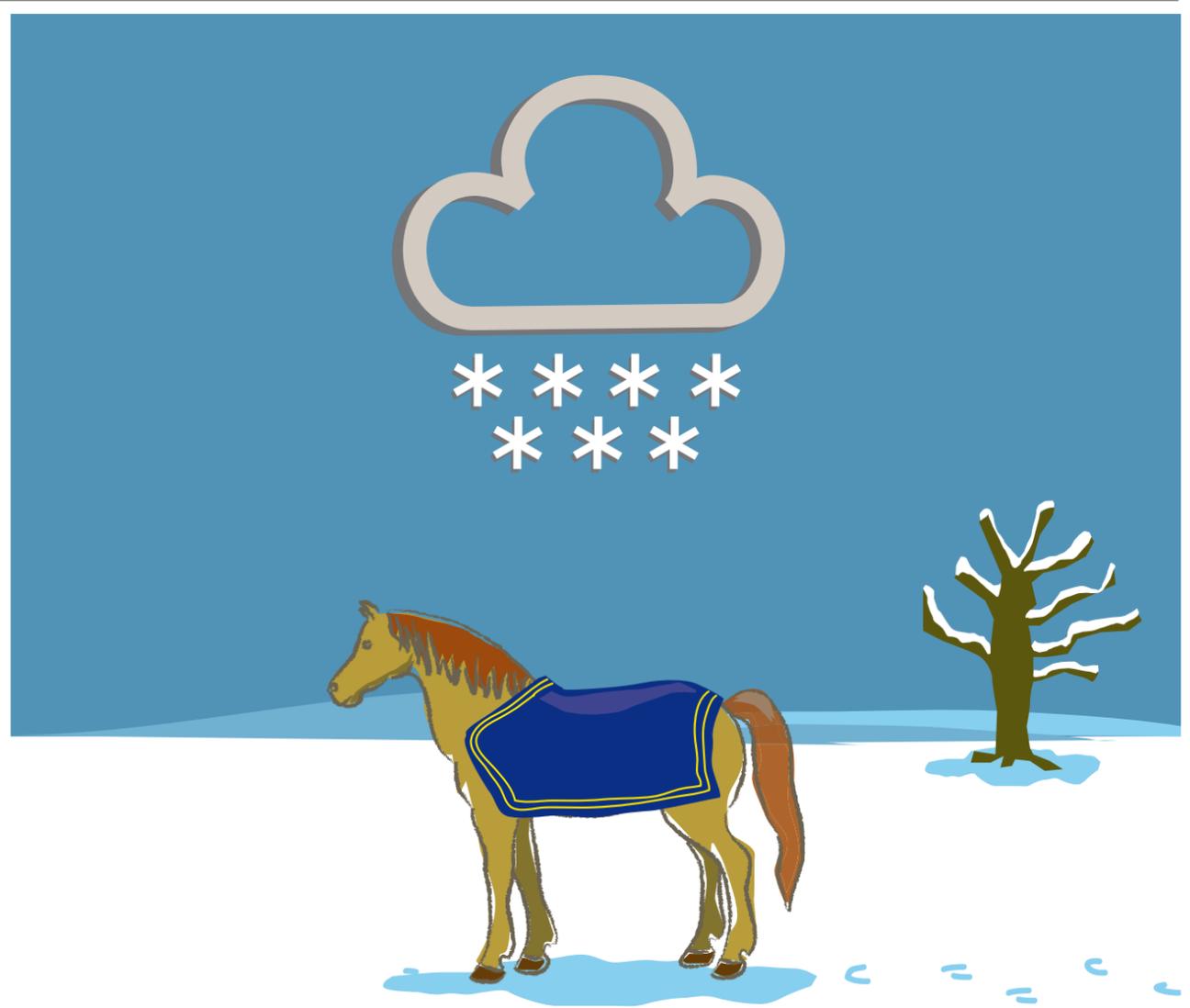
■ The veterinary surgeon should always act in the animal's best interest. Orthodontic treatments that work successfully in humans often require months and years of professional treatment. Just because it can be done is often no justification for putting an animal through multiple anaesthetic episodes to improve its appearance enough to enter the show ring, and go on to produce more pups with the same problem. If there is any doubt or dispute, a specialist opinion should be sought.



Figure 7. Rostral crossbite of the two maxillary central incisors, with both teeth occluding distal to the normal position of scissor bite.



Figure 8 (left). Lingual displacement of mandibular canines.
Figure 9 (below). A dog's hard palate with an infected puncture wound, caused by lingually-displaced mandibular canines. Immediately rostral are damaged areas of mucosa from the incisors.



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■ BITE ABNORMALITIES – from page 11

short lower jaws, rostral growth of the mandibles is prevented by the interlock, so the mandibular bodies then bow ventrally.

● To provide space for the following permanent canine teeth. The permanent lower canine teeth erupt on the lingual side of the lower deciduous teeth.

Appropriate and careful extraction of the lower temporary canines at this time will relieve the pain and provide space, so the permanent canine teeth can erupt into the normal diastema between upper canine and incisor teeth, inclined buccally as is normal.

Another example is mixed dentition – temporary and permanent teeth, most often incisors. Extraction of the temporary teeth is desirable to relieve crowding. It is wise to radiograph the area first, as inadvertent extraction of a permanent tooth can result in a very unhappy client.

Common clinical malocclusions

● Anterior crossbite

This defect can be inherited or acquired. Possible aetiology can be retained temporary incisors, crowding of the upper incisor arch or trauma that pushes the upper permanent incisors caudally. In most cases, the space available is insufficient for the number of teeth – even when the numbers are correct (Figure 7).

Breeders often carry out orthodontic manipulation using elastic bands, with disastrous results. The author has seen many cases of slipped bands

causing periodontal disease and requiring extraction of the whole arch. Orthodontic treatment can involve an acrylic brace with an expansion screw, or an archbar with buttons and elastic bands, which has been reasonably successful in correcting this problem as long as the arch is not crowded.

If the arch is crowded, it is not possible to push a tooth to a location that has insufficient space without affecting a tooth that is currently there. In human orthodontics, this may require removal of a tooth or teeth to create space. In veterinary orthodontics, owners of show dogs will rarely give permission for extraction as they want to continue to show the dog with full dentition.

Before embarking on orthodontics of this type, the owner and the vet must remember that the device may well have to be in place for 12 weeks or more.

In addition, the veterinarian should carefully examine the ethical position.

This is generally not a dysfunctional condition and is usually due to crowding of the incisor arch. In these circumstances, such treatment may not be in the best interest of the animal or the breed.

● Wry mouth

In this condition, which is considered to be inherited, one side of the mandible and/or maxilla is longer, leading to asymmetry in the sagittal plane.

Treatment, if required, must centre on abnormal tooth contact that either causes soft tis-

sue trauma or prevents normal mouth closure. Strategic extraction of crown amputation with appropriate root canal work is the usual treatment performed.

● Posterior crossbite

In these cases, the mandibular carnassial (molar one or 409/309) is located buccal to maxillary carnassial (premolar four or 108/208). This often results in more rapid accumulation of calculus and the area becomes more prone to periodontal disease.

Treatments range from diligent homecare to more sophisticated disease management. Odontoplasty (reshaping of the tooth followed by sealing of the exposed dentine tubules) may be required if the sharp cusps cause trauma to soft tissue on the opposite arch.

● Lingually-displaced mandibular canines (base-narrow canine teeth)

This is the most common reason for orthodontic referral, due to the pain and soft tissue damage involved. On its own it would be classified as a class one malocclusion, but in many cases it is combined with mandibular brachygnathism and, therefore, rates as a mixed class two/class one malocclusion.

This condition is due to an autosomal recessive mutation in at least one breed, the German short-haired pointer¹. If these animals are treated, neutering should be strongly advised.

The lower canines erupt in a dorsal direction, rather than buccally, and fail to find their normal position in the diastema between the upper canine and

incisor three. This usually injures the soft tissue of the opposing hard palate. It can occur with both deciduous and permanent dentition, or with permanent dentition alone (Figure 8). The permanent lower canine teeth erupt on the lingual side of the lower deciduous teeth.

If it is a problem with deciduous teeth, it is most often picked up at puppy vaccine visits. Appropriate and careful extraction of the lower temporary canines at this time will relieve pain immediately and provide space so the permanent canine teeth can eventually erupt into the normal diastema between upper canine and incisor teeth, inclined buccally.

Extraction of deciduous mandibular canine teeth requires great care for two reasons:

● The whole tooth must be removed. Fractured remnants may still deviate the following permanent tooth's eruption path and cause local osteomyelitis from remaining infected pulp.

● The following permanent tooth bud is located immediately lingually to the deciduous tooth, so any instrumentation of the lingual half of the deciduous tooth will result in enamel damage to the permanent tooth.

If this is seen in the young adult (five to eight months usually), treatment is usually essential to allow the mouth to close without pain. Most pups already have large pits in the hard palate filled with pus, food and other debris (Figures 9 and 10). Treatment can take three forms, depending on the clinical picture:

● Orthodontic tipping with a custom-built composite resin bite plane attached to the upper

rostral dentition. An incline is cut into this plane, which the lower canine crown tips engage.

Using the dog's own powerful masticatory muscle power, the lower canine teeth tip buccally and advance up the incline over a few weeks. Not all cases are suited to this treatment because the lower canine teeth are often behind the upper canines. However, it is a quick and non-invasive way of dealing with the problem and it is well tolerated by most dogs.

● Shortening the lower canine crowns surgically and performing a partial coronal pulpectomy on the exposed pulps. This will inevitably open the sterile pulp chamber. Since the canine teeth are usually immature at the time of surgery, thin dentine walls, large wide pulps and incomplete closure of the root apex complicate treatment.

Partial pulp removal under sterile conditions followed by an appropriate pulp dressing is required. The failure rate for this treatment is considered to be high, at around 25 per cent. Failure means subsequent pulp death and requires further endodontic treatment or extraction at a later date.

● Surgical extraction (Figures 11 and 12) of the lower canine teeth and incisors. This option is often considered quite extreme, but it has advantages – it will immediately alleviate discomfort, and it is a one-off procedure that requires no complicated follow-up.

Once the long lower canine teeth are removed, it is often possible to see actual soft tissue contact between the sharp cusps of the lower incisor teeth and the hard palate. If this happens, the lower incisors should also be removed.

One disadvantage is the void left behind after extraction. However, the use of appropriate osseopromotive agents in the dental alveolus of the extracted lower canine teeth will limit loss of strength.

Reference

1: Byrne and Byrne (1992), *Veterinary Record*, 130: 375-376.



Figure 12. (a) A year-old dachshund with persistent right upper deciduous canine (504) and lingually-displaced right lower permanent canine (404). Note the reduced diastema width between the RU permanent canine (104) and the corner incisor (103).



(b) Intraoperative view of surgical removal of 504. Note the length and direction of root.



(c) Right view following closure of extraction flap for 504 and crown amputation and root canal filling of the right lower permanent canine (404).



(d) Occlusal view of both lower permanent canine teeth following crown amputation and root canal filling to prevent traumatic contact with the palate.



Figure 11. (a) Left-side view of Rizla, a nine-month-old Hungarian vizsla.



(b) Rizla presented with severe lingual displacement of the right lower canine (404).



(c) This trauma-induced pit in the hard palate communicated with the nasal cavity.



(d) Postoperative view of the site following removal of the canine.

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