VETERINARY NURSING OF EXOTIC PETS

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Veterinary nurse and veterinary student training in exotic species has come a long way in the last four or five years. Previously often consigned to the category of ‘alsorans’, exotic species are increasingly seen in general veterinary practice, to the point where the house rabbit has officially become the UK’s third most commonly kept pet, after the cat and dog. Even more telling is the fact that numbers of cats and dogs in the UK are on the decline, yet the number of small mammals, reptiles and birds kept by the public continues to rise.

With this increase in these species kept as household pets, improved training in their care has thankfully started to become more important. Many veterinary schools and veterinary nurse training providers are devoting more time to teaching the husbandry and medicine of exotic species. Indeed, 2001 saw the start of the first course in Veterinary Nursing of Exotic Species, run through Edinburgh’s Telford College and leading to a City and Guilds recognised qualification.

There is no turning the clock back. Exotic pet species are here to stay. It is therefore our duty as veterinary surgeons and veterinary nurses to ensure that we are up-to-date with the latest husbandry and medical details so that we may offer as good, if not better, levels of care as that provided for more traditional domestic pets.

I hope that this book will help in that quest and may be of use to veterinary nurse, technician and veterinary student alike.

Simon J. Girling
Avian Species
Chapter 1
Basic Avian Anatomy and Physiology

Classification

Birds are classified into many different family groups, according to a number of physical, anatomical and evolutionary factors. It is useful to know to which group a bird belongs as this gives an indication of the other birds it is related to. This is of some help when faced with a species that you have not seen before.

Table 1.1 contains some of the more commonly encountered family groups of birds seen in general and avian orientated practices.

The Psittaciformes are among the most colourful of birds kept as pets.

Nervous system

The avian brain is extremely smooth, lacking the many gyri (the ridges in the brain) seen in mammals (Fig. 1.1). Sight appears to be the dominant sense in birds. Two large optic lobes lie between the cerebral hemispheres and the cerebellum, and it is here where the optic nerves communicate and disseminate information.

The avian nervous system is not dissimilar to that seen in its mammalian counterpart. Birds possess 12 cranial nerves, the same number as the cat and dog. In the bird, the optic nerve is the largest.

Each of the wings has a nervous supply from a brachial plexus derived from the spinal nerves in the caudal cervical area. A lumbar plexus in the cranial kidney area supplies the body wall and upper leg muscles. Unlike dogs and cats, birds have an ischiatic plexus which is derived from spinal nerves in the sacral area and which is situated in the mid-kidney structure. It gives rise to the principal nervous supply for the hind limbs – the ischiadic nerve. Finally, a pudendal plexus forms in the caudal kidney area from the spinal nerves and innervates the tail and cloacal area.

Musculoskeletal system

Most birds have the power of flight. The dense, cumbersome bones of the earthbound mammal would require too much effort to lift into the air. Birds have therefore adapted their skeletal structure, simplifying the number of bones by fusing some together, and generally lightening the whole structure by creating air spaces within many of the bones.

To further lighten the skeleton several of the larger bones, and even some of the vertebrae in the spine, are connected directly or indirectly to the airways, and are said to be pneumonised. This replaces the thick medullary cavity or bone marrow present in the center of mammalian bones, and produces a light, trabecular structure. While light, the structure is nevertheless extremely strong.

Figure 1.2 shows a generalised avian skeleton.

Skull

Beak

The beak, or bill, is the principle feature of the avian skull. It has been modified into a bewildering number of shapes and sizes, depending mainly on the diet to which the bird has become adapted. In all cases it is composed of an upper (maxillary) and lower (mandibular) beak which are covered in a layer of keratin, a tough protein compound similar to that which forms the exoskeleton of
insects. This keratin layer is known as the *rhamphotheca*. It is further classified so that the maxillary layer is referred to as the *rhinotheca*, and the mandibular layer as the *gnatotheca*. The rhinotheca and gnatotheca grow from a plate at the base of the respective sides of the beak, the rate of replacement depending upon the type of food eaten and the abrasion the beak receives.

In Psittaciformes (Table 1.1), the upper beak is powerfully developed and ends in a sharp point overhanging the broader, stouter lower beak (Plate 1.3). The tremendous power in a parrot’s beak is due to a synovial joint or hinge mechanism, known as the *kinetic joint*, which joins the beak to the skull. The parrot’s lower beak has a series of pressure sensors at its tip, which allow it to test the consistency and structure of objects grasped.

In raptors, the upper beak is extremely sharp and pointed, but lacks the kinetic joint attachment so it cannot produce such powerful downward force. Instead, it is used as a ripping instrument.

In Anseriformes (the duck family), the beak is flattened and may have fine serrations at the edges that allow the bird to filter fine particles from the water. Ducks such as mallards and shovellers have this type of beak. These serrations may be further developed to a jagged edge (for example, in the aptly named sawbill family) which allows the bird to grip slippery food, such as fish. Anseriformes also have nerve endings in a plate at the tips of their beaks (known as the ‘nail’) that allows them to find food hidden in mud.

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**Table 1.1** Avian family groups commonly encountered in veterinary practice.

<table>
<thead>
<tr>
<th>Order</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Psittaciformes</strong></td>
<td>This is the order of birds which includes those we know as ‘parrots’. This includes the budgerigar, the amazons, the macaws, cockatiels, African grey parrots (Plate 1.1), cockatoos (Plate 1.2), parakeets and others.</td>
</tr>
<tr>
<td><strong>Passeriformes</strong></td>
<td>This is the largest order of birds and includes the canary, the finch family, birds of paradise, the mynah birds, ornamental starlings, sparrows and others.</td>
</tr>
<tr>
<td><strong>Anseriformes</strong></td>
<td>This order includes:</td>
</tr>
<tr>
<td></td>
<td>• the duck family, for example the mallard, shovellor and shelduck;</td>
</tr>
<tr>
<td></td>
<td>• the goose family, for example the barnacle, and greylag;</td>
</tr>
<tr>
<td></td>
<td>• the sea duck family, for example the eider and smew;</td>
</tr>
<tr>
<td></td>
<td>• the swan family, for example the mute, Whooper’s and Bewick’s swans.</td>
</tr>
<tr>
<td><strong>Rhamphastidae</strong></td>
<td>This order includes the toucan, toucanette and hornbill families.</td>
</tr>
<tr>
<td><strong>Strigiformes</strong></td>
<td>This covers the owl families.</td>
</tr>
<tr>
<td><strong>Falconiformes</strong></td>
<td>This order covers:</td>
</tr>
<tr>
<td></td>
<td>• the Falconidae family, for example the peregrine falcon, the saker, the lanner, the gyrfalcon;</td>
</tr>
<tr>
<td></td>
<td>• the Accipitridae family such as the buzzards (common, rough-legged and honey), the sparrowhawk, goshawk, golden eagle.</td>
</tr>
</tbody>
</table>

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**Fig. 1.1** Dorsal aspect of avian cerebral hemispheres showing lack of gyri.
In all birds there is a series of smaller bones behind the lower and upper beaks which allows them to move the beak independently of the skull. These include the palatine, quadrate and pterygoid bones and the jugal arches. Their exact movements are beyond this text to describe, but many of the references at the end of this chapter give good accounts of their function.

**Nostrils**

The nostrils, or nares, lie at the base of the upper beak in most birds and are often surrounded by an area of featherless skin known as the cere. This may be highly coloured in some species, such as the budgerigar, where they may be used to identify the sex of the bird. In many Anseriformes the nares lie more towards the tip of the beak. The nares themselves are merely openings into the sinus chambers, which in turn connect with a branching network of bony chambers throughout the bird’s head. These sinuses vary according to the species, but the majority of avian patients have an infraorbital sinus. This sits below the eyes, and is often involved in sinus and ocular infections. These sinuses also communicate with head and neck air-sacs. The function of these air sacs is not clear, but they may help with voice resonance.

When a bird suffers from sinus infections, the narrow inlets to these sinuses may become partially blocked and act as one-way valves, allowing air into the sacs but not out. The sacs may then overinflate and soft swellings are then commonly seen over the back or nape of the bird’s head.

The sinuses and external nares communicate with the oropharynx via the choanal slit. This is a narrow opening in the midline of the hard palate. It is often the area chosen for taking samples when trying to isolate infectious agents for upper airway disease in birds.

The skull of the avian patient connects to the **atlas** (or first spinal vertebra) via only one occipital condyle at the base of the skull, unlike the mammalian two. There are also a large number of highly mobile cervical vertebrae. These two factors make the avian head extremely agile. However, the atlanto-occipital joint is also a weak point, making dislocation at that site very easy.

**Vertebral column**

**Cervical vertebrae**

The cervical vertebrae (Fig. 1.2) are independently mobile in the avian patient, as they are in the mammalian patient, and vary in number
depending on the species between 11–25. They are generally box-like in form.

**Thoracic vertebrae**

The thoracic vertebrae (Fig. 1.2) are fused in raptors, pigeons and many other species to form a single bone known as the *notarium*. In other species they have some limited mobility. There are then two intervertebral joints between the notarium and the fused lumbar and sacral vertebrae. These fused vertebrae are known as the *synsacrum*.

**Coccygeal vertebrae**

The majority of the caudal coccygeal vertebrae (Fig. 1.2) are usually fused into a single structure known as the *pygostyle* – which forms the ‘parsons nose’ part of the chicken!

**Pelvis**

The roof of the pelvis is formed by the synsacrum (Fig. 1.2). The two ‘sides’ of the pelvis are reduced in size compared with mammals but consist of the ilial and ischial bones, with the *acetabulum* being created where they meet. The acetabulum in birds is not a complete bony socket as it is in mammals, but a fibrous sheet. There is a ridge on the lateral pelvis known as the *antitrochanter*, which articulates with the greater trochanter of the femur. The function of this ridge is to prevent the limb from being abducted when perching. The pubic bones of the pelvis do not fuse in the ventral midline as in mammals. Instead they form fine long bones which extend caudally towards the vent. They provide support for the skin covering the caudal abdomen and enough space for the passage of eggs in the female bird.

**Ribcage**

Psittaciformes have eight pairs of ribs (Fig. 1.2). Each rib has a dorsal segment known as the thoracic rib, and a ventral segment, or sternal rib. These ribs point backwards and rigidly connect the thoracic vertebrae dorsally and the keel, or sternum, ventrally.

**Sternum**

The sternal vertebrae are fused in birds to form the keel. The keel has a midline ridge which divides the pectoral muscles into right and left sides. The ridge may be a deep structure, as is seen in pigeons, raptors and Psittaciformes, allowing large pectoral muscles to attach for strong flight. Alternatively the keel may be flattened, as with Anseriformes, to provide a boat-like structure more suited to floating.

**Wings**

The shoulder joint is formed by the meeting of three bones, the humerus, the scapula (which is more tubular than the flattened mammalian one) and a third bone, known as the *coracoid* (Fig. 1.2). This latter bone forms a strut propping the shoulder joint against the sternum. The supracoracoid muscle attaches to the keel, then passes through the *foramen*, or opening, formed at the meeting point of these bones, and so reaches the dorsal aspect of the humerus where it attaches. Contraction of this muscle, along with some elastic tissues which are also present, helps to raise the wing. The pectoral muscles attach from the keel onto the humerus to pull the wing downwards. The fused clavicles, or wishbone (often referred to as the *furcula*), articulate with the coracoid bone and provides a degree of spring to the flapping of the wings. The humerus is pneumonised, which means that it cannot be used for intraosseous fluid therapy. This is also an important point to consider when repairing fractures.

The humerus articulates with the radius and ulna at the elbow joint. The radius is the smaller of these two bones, and lies cranially. The ulna provides the source of attachment for the secondary flight feathers, which insert directly into the periostem of this bone (Fig. 1.3). The ulna is often used for intraosseous fluid administration in birds.

The radius and ulna articulate with one radial carpal bone and one ulnar carpal bone respectively. These in turn articulate with three metacarpal bones. The first metacarpal bone is the equivalent of the avian ‘thumb’. It is known as the *alula*, or ‘bastard wing’, and forms a feathery pro-
jection from the cranial aspect of the carpo-metacarpal joint. The remaining two metacarpal bones are known as the major and minor metacarpal bones, and articulate with the first phalanx cranially and the minor digit caudally. The first phalanx then articulates with the second phalanx, forming the wing tip. The primary feathers attach to the periosteum of the phalanges and minor metacarpal bones (Fig. 1.3).

The area of the wing is enlarged by thin sheets of elastic tissue which span from one joint surface to another. The largest extends from the shoulder to the carpal joint cranially and is known as the propatagium, or ‘wing web’ (Fig. 1.4). This can be used in some species, such as pigeons, for vaccine administration.

Pelvic limb

The acetabulum of the pelvis holds the femoral head (Fig. 1.2). The limb may be locked, and prevented from being abducted, by the greater trochanter of the femur engaging with the antitrochanteric ridge on the pelvis. The femur is pneumonised in many birds. At the stifle joint the femur articulates with the patella and the