Rabbits: interpreting X-rays revealing common conditions

Skull Radiology

Aims

- To enhance your ability to evaluate skull radiographs improving diagnostic potential from a non-invasive source
- To improve your ability to obtain consistent, high quality diagnostic skull radiographs
- To apply radiographic findings to clinical treatment of rabbits under your care

Reasons To Take Skull Radiographs

- Dental disease
- Ocular disease
- Aural disease
- Upper respiratory tract disease
- Neurological disease
- Trauma

Or split into clinical signs including: anorexia, drooling, dropping food, failure to eat caecotrophs, ocular discharge, nasal discharge, facial deformity/asymmetry, dyspnoea, head tilt, ear pain, head shaking.

Limitations

- Requires sedation or anaesthesia
- Provides only a two dimensional view of the skull
- Soft tissue changes may be over-looked
- Requires experience for accurate interpretation

Positioning; The Classical 5 Views

- A straight ventro-dorsal or dorsoventral
  1. Place in dorsal or ventral recumbency
  2. Extend the neck so that the long axis of the head is parallel to the table
  3. Make certain that each side of the head is level
  4. Taping the ears to keep the head still or using foam wedges may be helpful if the skull is very deformed.
  5. Allows visualisation of the temperomandibular joint, the zygomatic arch, the tympanic bullae and facial tuberosity.
  6. Superimposition complicates evaluation of all but the first maxillary cheek teeth.
A straight lateral

1. Place the rabbit in lateral recumbency
2. Extend the neck forward
3. Make certain that the long axis of the nose is parallel to the table
4. Use of foam wedges maybe helpful
5. The edges of both ventral mandibles and the tympanic bullae should be overlying each other, the hard palate should appear as a single line and the anterior edge of the orbits should be directly overlying each other.

- A straight rostrocaudal
  1. Place the rabbit in dorsal recumbency
  2. The long axis of the nose should be perpendicular to the table in both the antero-posterior and lateral directions
  3. The xray beam should shoot directly down the rabbits nose
  4. Allows evaluation of the occlusal surface between cheek teeth arcades, the condyloid process and an assessment of lateral deviation of the mandibular and maxillary crowns

- Two oblique lateral views (one on each side)with the upper side of the head turned approximately 30 degrees dorsally around its long axis.

  1. Place the rabbit in lateral recumbency
  2. Adjust the position so that the long axis of the nose is parallel to the table top
  3. Rotate the head about the long axis so that the upper ear is pulled dorsally approximately 30 degrees
  4. Repeat on the other side.
  5. This allows for separation of the mandibular cheek teeth apices, the tympanic bullae, the maxillary cheek teeth apices on the other side, and separates the condyloid processes.
  6. Too great a rotation will cause distortion artefact on the radiograph
Contrast Radiography

- Allows highlighting of pathology in the nasolacrimal duct and also abscess cavities.
- Use Sodium/meglumine iothalamate (Conray)
- Can assess the level of blockage of the nasolacrimal duct and the extent of abscess cavities with reserve crown involvement. Allows better surgical planning.
- Cheap and easy to do in practice

Dental Terminology

- Apex
  1. The tip of the reserve crown
- Germinal Tissue
  2. The area at the end of the reserve crown/apex where the tooth grows from
- Occlusal surface and pattern
  3. The surface of the clinical crown where food is ground down
- Clinical crown
  4. The portion of the tooth that has erupted from the jaw and can be seen within the mouth
- Reserve crown
  5. The portion of the tooth that is still within the jaw from the apex to the gumline
- Enamel fold
  6. Folds of enamel extending the length of the cheek teeth, creates ridges on the occlusal surface that allows the diet to be ground down
- Dentine
  7. The softer portion of the tooth, is folded around the enamel
- Pulp cavity
  8. Seen at the apex of the reserve crown as two radiolucent areas extending into the germinal tissues. Normally extends two-thirds of the way up the tooth
- Periodontal space
  9. The space between the edge of the tooth and the bone of the jaw, where the periodontal ligament sits
- Alveolar crest
  10. The ridge of jaw bone at the edge of the tooth alveolus, can be difficult to see on normal radiographs
- Laminar dura
  11. The radiodense line of the alveolar socket. Best seen on the first cheek teeth and at the apices. It is the radiodense bone into which the periodontal ligament binds
Rabbit Dental Formula

- Incisors 4/2
- Canines 0/0
- Premolars 3/2
- Molars 3/3
- Total of 28 teeth.

Teeth as a Dynamic Physiological Unit

- Mechanics of tooth growth vs wear
  - Upper incisors grow 10-12cm/year (2mm/week), lower incisors grow 20cm/year (2.4mm/week)
  - Cheek teeth grow 5-5.5cm/year (1mm/week)
  - The tips of the lower incisors should sit in the space between the upper incisor 1 and the peg teeth behind them. The inside surface of the incisors is dentine not enamel (the outer surface is enamel) and this allows the differential wear and the formation of the chisel shape of the tooth.
  - The occlusal surfaces of the cheek teeth are formed of ridges of enamel swirled between troughs of enamel. This gives an efficient grinding surface.

- Chewing movements
  - Natural cheek tooth grinding occurs in a lateral direction in rabbits. Because the upper arcades are wider than the mandibular ones, only one sides arcade occlusal surfaces can be in contact at any one time. The lower jaw follows a crescent shaped trajectory during mastication.
  - With some pelleted diets, the rabbit needs to alter its natural jaw movement to a more vertical one in order to break the food down. This can lead to abnormal forces on the teeth.

- What happens when something goes wrong?
  - When the cheek teeth are not being ground down (ie due to anorexia or starvation) there are two possible outcomes; either the clinical crowns elongate within the mouth or the reserve crowns elongate within the jaw. Intra-orally the clinical crowns can elongate and cause the mouth to be held further open which in turn allows the tips of the incisors to overgrow and possibly misalign. Alternatively the clinical crowns can form spurs that can damage the soft tissue of the tongue and cheeks.

- An apparently short period of anorexia can be sufficient to cause subclinical acquired dental disease to become clinically apparent.
- An oral examination should be part of EVERY rabbit consultation, and remember a spur of 1mm or less can be enough to cause anorexia in a rabbit.
Radiographic Markers

- Incisors
- Cheek teeth
- Pulp cavity
- Apex
- Lamina dura
- Mandible
- Ventral cortex
- Coronoid process
- Condyloid process
- Angular process
- Masseteric fossa
- Temporomandibular joint
- Incisive bone
- Nasoturbinates
- Ethmoturbinates
- Petrous temporal bone
- Zygomatic bone
- Facial tuber of maxilla
- Maxilla
- Paranasal sinuses (conchal and maxillary sinuses or recesses)

Dental Charting

- Method for recording examination and radiographic findings as well as indicating the treatment undertaken.
- Several versions are available; however it is important to be consistent in their usage.
Anaesthesia and Supportive Care

How To Avoid Disaster

- The biggest impact on survival is good case selection
- Do a thorough physical examination
- Correct any issues found prior to anaesthesia
- IE give fluids, make certain the guts are moving, treat any confounding underlying conditions.
- Consider pre-operative blood work

Anaesthetic/Sedative Agents

- NB the cascade
- Hypnorm (fentanyl/fluanisone) is the only agent licensed for rabbits in the UK 0.2-0.3ml/kg
- It can be combined (off license) with diazepam 1mg/kg or midazolam 1mg/kg
- May be reversed with butorphanol 0.1mg/kg
Other Agents

- Triple Combination: medetomidine 0.15mg/kg and ketamine 5mg/kg and either butorphanol 0.5mg/kg or buprenorphine 0.01mg/kg
- This is not licensed for rabbits in the UK
- I generally give both the medetomidine and ketamine by deep intramuscular injection initially then use the opioid intravenously to control depth if required.

Other agents 2

- Intravenous propofol 3-5mg/kg after premedication with acepromazine 0.25-1mg/kg +/- opioids +/- benzodiazepines
- Intravenous alfaxalone after premedication as above 6-9mg/kg IV or 9mg/kg IM
- Etomidate for IV induction, dexmedetomidine as alternative to medetomidine.
- Ketamine 10mg/kg + diazepam 0.5mg/kg or midazolam 2-5mg/kg
- Atropine and glycopyrrolate 0.01-0.02mg/kg
Inhaled Agents

- Not advised as sole agents for anaesthesia
- Isoflurane: smells quite pungent and can cause rabbits to refuse to breathe, particularly if used without premedication. This can prove fatal, particularly as isoflurane can potentiate arrhythmias caused by adrenaline release.
- Sevoflurane: smell is much less strong and affects the willingness to breathe much less than isoflurane. The depth of anaesthesia may alter more rapidly with sevoflurane but this is often not noted clinically.

How to intubate a rabbit

- Can either be done blind or using and endoscope or otoscope cone, or a laryngoscope
- Advantages of blind intubation is that it is quick and easy however if food is retained in the oropharynx then this can be pushed into the trachea. It is also easier to traumatis the larynx making laryngospasm more likely. Relies on the rabbit actually breathing.
- Using a light/visualisation tool means you can see the glottis and thread the tube in accurately therefore you are not reliant on the rabbit breathing. Also will make aspiration of food less likely.
Intubation 2

- Using endoscope/otoscope/laryngoscope means that there is less room in the mouth for manoeuvre so can be fiddly.
- Top tips are to lubricate the tube and apply xylocaine spray either to the glottis directly or to the tube.
- Tube size will often be smaller than you would imagine.
- Extend the rabbit’s neck, localise the larynx and guide the tube towards it, disengage the soft palate from the glottis, wait for a breath and then rapidly advance the tube through an open glottis.
- Extending the neck too much will narrow the tracheal diameter and make intubation more difficult.

Post-operative Considerations

- Monitor carefully for return to full consciousness, problems breathing can cause a fatal bradycardia.
- Monitor for voluntary feeding.
- If a rabbit does not eat voluntarily within an hour +/- of wakening then it should be assist fed and fluid therapy either continued or repeated.
- Use for example Supreme Recovery/Recovery Plus.
Post-operative considerations 2

- If voluntary feeding does not resume rapidly then re-assess pain relief initially and correct and problems
- Check for gut sounds (a stethoscope on each side of the abdomen, listen for up to a minute)
- Consider prokinetic agents such as metoclopramide and ranitidine
- Maintain gut mobility by repeated assist feeding with a suitable product at approximately 20ml/kg four times daily