

Head and Neck Surgery

Mini Series

Session 3: Surgery for Tumours of the Neck and Head

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Surgery for Tumours of the Head

Oral tumours

Oral tumours account for approximately 6% of all canine tumours. Approximately 40% are benign including the epuli group. The epuli group have now been reclassified as odontogenic tumours. The majority of malignant tumours are non odontogenic tumours and in descending order of frequency are malignant melanoma, squameous cell carcinoma (SSC) and fibrosarcoma.

Classification of oral tumours

Odontogenic	Non Odontogenic
<ul style="list-style-type: none">• Odontoma• Peripheral odontogenic fibroma• Ameloblastoma<ul style="list-style-type: none">CentralAcanthomatous	<ul style="list-style-type: none">• Malignant melanoma• Squamous cell carcinoma• Fibrosarcoma• Osteosarcoma• Multilobular osteocondrosarcoma• Plasmacytoma

Peripheral Odontogenic Fibroma

These arise from the periodontal ligament. They were previously classified as fibromatous and ossifying epulis. Local removal often curative although sometimes needs combining with dental extraction.

Central ameloblastoma

These arise from enamel forming cells. They are slowly growing and expansile with distortion of bone and teeth resulting. They appear cystic on radiographs Their behaviour is benign and surgery with a 0.5-1cm bone margin is curative.

Canine Acanthomatous Ameloblastoma

These were previously classified as acanthomatous epuli or basal cell carcinoma. They arise from the odontogenic epithelium of the gingiva. They are benign but generally invasive into bone. Surgery with a 0.5-1cm bone margin is curative.

Squameous Cell Carcinoma

Gingival SCC is commonly a fleshy ulcerated mass with a predilection to the rostral mandible. Metastatic rate to region lymph nodes is low approximately 10%. With margins including bone of not

less than 1 cm a cure can often been achieved. A worse prognosis is associated with caudal lesions, larger lesions >2cm and maxillary lesions.

Malignant melanoma

Malignant melanoma is typically a pigmented gingival mass however it should be noted that 50% are amelanotic and therefore not visually diagnosed as melanoma. Malignant melanoma is a highly metastatic tumour with 20% demonstrating metastasis at presentation and only 25% of cases surviving one year due to development of distant metastasis. The local disease is often controlled with margins of 1 -2cm. The size of the mass <2cm or >2cm and presence of metastatic disease has a significant effect on prognosis.

A recent development in therapy is the melanoma vaccine. This had made treatment of malignant melanoma much more successful. Dogs with Stage 2 or 3 melanoma which has been locally controlled did not reach median survival time ie 50% dead when the vaccine was given. Stage 2 is a melanoma <2cm without metastasis and stage 3 is less than 2cm with nodal metastasis.

Fibrosarcoma

Fibrosarcomas are often large flat lesions often occurring in the caudal maxilla in dogs. They have a tendency to occur in younger dogs than the other oral tumours. Particularly aggressive forms can be seen in young dogs. Achieving a cure in these dogs can be difficult in these cases with high local reoccurrence rates even with 2-3 cm margins. It is worth being aware of the histologically low grade biologically high grade fibrosarcoma seen in young Golden Retrievers.

Tumour Type	Metastatic rate	1 year survival	Reason for failure
Squameous cell carcinoma	10%	80%	Local reoccurrence
Malignant melanoma	40-70%	25%	Distant metastasis
Fibrosarcoma	20%	40%	Local reoccurrence

Osteosarcoma

Osteosarcoma of the skull accounts for approximately 7% of the total cases seen. It is generally seen in middle aged and older medium-large breed dogs. Survival time is better than for appendicular osteosarcoma. Favourable prognostic indicators include mandibular location and complete excision. Cause of death more commonly local reoccurrence rather than metastasis. A 60% 1 year survival when treated with surgery alone is reported. Role of chemotherapy unknown so its use requires careful case selection.

Multilobular Osteochondrosarcoma (MLO)

These mainly occur on skull and have a typical stippled appearance on imaging. They can be treated with surgery with 2cm bone margins. Unfortunately there is 50% local reoccurrence but median survival is still 800days. The high reoccurrence rate is partly because they tend to occur in locations where the wide bone margins are difficult to achieve.

Clean surgical margins predictive of outcome (Clean margin 1332 days 42% vs Dirty margin 320 days 76%). 50% of cases develop metastasis but time to metastasis prolonged. Grade maybe predictive of outcome with higher grades having higher local reoccurrence and metastasis.

Plasmacytoma

These are an extramedullary plasmacytoma accounting 5.2% of oral tumours. Surgery with 1cm bone margin curative. They are radio sensitive. This is generally a local disease and metastasis or development of multiple myeloma extremely rare.

Assessment of oral masses

- **Biopsy of mass**

Due to high variation in biological behaviour pre surgical diagnosis is essential. Ensure tissues such as lip are not contaminated by biopsy procedure as these are used in reconstruction.

- **Assess local extent of tumour**

Minimum of high quality intra oral radiographs. Consider advanced imaging particularly for caudal and extensive lesions. CT scanning is often the most useful modality.

- **Assessment of regional lymph nodes**

Palpation and FNA

- **Thoracic radiographs**

Both inflated lateral views. Reported incidence of visible metastasis with oral masses is 7%.

Mandibulectomy and Maxillectomy

Surgery is the most effective treatment for most oral tumours. Surgery is the treatment of choice if clean margins can be achieved. This margin must always include bone for malignant tumours requiring the use of mandibulectomy and maxillectomy procedures. Failure usually occurs due to the failure to include bone or underestimation of the extent of the mass.

Cosmetics and function with these procedures is good to excellent in most cases except for radical maxillectomies. Client satisfaction is high reported at 80-85%. Satisfaction can be improved by careful client counselling and including showing the client post operative images prior to surgery.

Mandiblectomy

The limits of resection for mandiblectomy include the whole hemi mandible on one side or bilaterally to PM1 (this has been performed to PM4 but this should not be performed routinely. There are a number of types of mandiblectomy depending on the margin required for tumour resection.

Types of mandiblectomy

- Full hemi-mandiblectomy
- Rostral unilateral mandiblectomy
- Bilateral rostral mandiblectomy
- Segmental mandiblectomy
- Vertical mandiblectomy

Equipment required

- Basic surgical kit - blade, tissue forceps, metzumbam scissors, haemostats, needle holders
- Periosteal elevator
- Oscillating saw (if not performing total hemi-mandiblectomy)
- Osteotome and mallet
- Diathermy
- Bone wax (if not performing total hemimandiblectomy)

Preoperative patient preparation

- Broad spectrum perioperative antibiotics
- Good analgesia combination opiates, NSAIDs and local blocks
- Well cuffed endotracheal tube and throat pack to prevent aspiration of blood
- Use of mouth gag to improve oral access

Total Hemi-Mandiblectomy technique

- Position dog in lateral recumbancy
- Incise around the mass with appropriate gingival and if appropriate lip margin.
- Elevate the mucosa from the mandible medially and laterally. Care lingually to preserve the salivary carnucles
- Separate the mandibular symphysis with osteotome and mallet or oscillating saw.
- Continue dissection caudally cutting the muscular attachments as encountered. Identify and ligate mandibular artery

- Elevate muscles from vertical ramus. This is facilitated by cutting the cheek full thickness from the commissure to the rostral aspect of the ramus. Take care to avoid the parotid duct which is usually dorsal to this incision.
- Elevate the digastricus muscles caudo ventrally, the pterygoid muscles medially and the masseter and temporalis muscles dorsally.
- Incise the tempromandibular joint capsule and dislocate tempromandibular joint
- Reappose muscles and mucosa. Suture mucosa with an short duration absorbable suture. Authors preference is Vicryl due to soft knot with good knot security
- Advance the commissure when closing the lip to reduce protrusion of the tongue.

Segmental Mandiblectomy technique

- Position in lateral recumbancy
- Incise at appropriate margin and elevate soft tissues as above to expose horizontal ramus.
- Cut ramus at cranial and caudal margins.
- Start cut dorsally as mandibular artery is located in the ventral third of the mandible and will bleed profusely.
- Once cut is complete clamp bleeding artery and stop bleeding with diathermy +/- small amount of bone wax.
- If cut in bone has damaged tooth roots extract damaged teeth.
- Close by apposition of mucosa.

Rostral Bilateral Mandiblectomy technique

- Position dog in dorsal recumbancy
- Elevate labial tissues with appropriate margins
- Cut bone with oscillating saw
- Often bone cut will leave behind part canine of canine roots which needs removing.
- There is no need to stabilise the two hemi-mandibles together.
- Excise V shaped section of redundant labial skin to improve cosmesis and function.
- Close by mucosa to mucosa simple interrupted suturing.

After care

- Continue IVFT until dog has adequate oral intake of fluids.
- Soft food for 4 weeks. Most dogs will eat within 24-48 hours post surgery. Feeding tubes rarely if ever required in dogs.
- Opiate analgesia 12-24 hours post surgery
- NSAIDs 7-10 days

- Broad spectrum antibiotics 7 days post surgery
- Collar only required in paws at faces or rubs excessively
- No chews, toys and bones for 4 weeks

Complications of mandibulectomy

Haemorrhage

This can be profuse with this procedure. It can be minimised with partial thickness bone cuts initially and making cuts through the ventral third of mandible and caudally last. This is usually seen intra-operatively but can occur in the first few days after surgery if the mandibular artery begins to bleed again.

Wound Swelling

This is common in the first few days and usually resolves with time and NSAID medication. Cold packing can be used if swelling is marked.

Wound dehiscence

This is relatively common reported in up to 33% of cases. Most commonly occurs over the rostral end of the osteotomised bone. It is particularly common over rostral mandibulectomies where there is limited soft tissue to suture. In most cases this will heal by second intention but in cases of large dehiscence debridement, lavage and re suturing is required.

Infection

This is not a common problem as the oral cavity heals rapidly and is relatively resistant to infection due to its extensive blood supply. A 7 day course of broad spectrum antibiotic after surgery is recommended.

Dental malocclusion

Mandibular drift will often occur after mandibulectomy. Generally does not cause a problem but if teeth cause trauma then canine extraction or canine shortening maybe required.

Drooling /tongue droop

This is common but can be reduced by advancing the lip commissure

Mucocele formation

Usually temporary and will resolve. Minimised with careful dissection around base of tongue.

Maxillectomy

Maxillectomy surgery can be more complex than mandiblectomy particularly with larger and more caudally located masses. Successful surgery requires a good understanding of anatomy of the bones of the skull particularly in 3 dimensions and good knowledge of vascular anatomy. A skull available at the time of surgery can be helpful.

Types of maxillectomy

- Unilateral rostral maxillectomy
- Bilateral rostral maxillectomy
- Caudal maxillectomy oral approach
- Caudal maxillectomy combined approach

Maxillectomy technique

- Incise around the mass with appropriate margins.
- Elevate mucosa to allow bone cuts to be made
- Ligate major palatine artery if encountered or control haemorrhage with pressure.
- Make partial thickness bone incisions. Bone incisions can be made with oscillating saw, osteotome and mallet or surgical bur. Complete incisions with transaction of the infraorbital canal and caudal incision last as bleeding from infraorbital and sphenopalatine arteries cannot be controlled until whole bone segment is removed.
- Ligate sphenopalatine artery as segment removed.
- Control bleeding from nasal turbinates. Placement of collagen (Lyosypt) over turbinates can help.
- Close defect with a labial flap sutured to mucoperiosteum. 2 layer simple interrupted closure preferred. Sutures can be placed through bone tunnels drilled in maxilla if further security is required. Undermining the hard palate for a few millimetres can help with suturing

Aftercare

As for mandiblectomy

Complications of maxillectomy

Haemorrhage

Care should be taken to monitor blood loss in patients undergoing these procedures. In my experience patients can lose 15-20% of circulating volume during these procedures. Although some of this bleeding is from transaction of major vessels such as the intraorbital, maxillary or palatine arteries which can be controlled by ligation, much is from constant ooze from the soft tissues and mucosal surfaces which is more difficult to control. Most patients will require colloid support during surgery to maintain blood pressure but rarely require transfusion.

Sneezing, epistaxis, failure to mouth breath

Care should be taken to ensure patients breath comfortably when recovering.

Subcutaneous emphysema

This is usually mild and self limiting.

Dehiscence/ Oronasal fistula closure

As for mandiblectomy but dehiscence will result in a fistula necessitating repair. This has been reported in 5-33% of cases. Most commonly occur due to tension and is more common with caudal maxillectomies.

Lip ulceration

Occurs if lip pulled to far into mouth to close defect and trauma is caused by lower canine. The problem maybe potentiated by the loss of sensation in the lip due transaction of the intraorbital nerve during tumour resection. Minimised by ensuring large enough flap created.

Epiphora

Occurs if nasolacrimal duct is disrupted by surgery. Has no significance other than cosmetics.

Wound Swelling

This is common in the first few days and usually resolves with time and NSAID medication. Cold packing can be used if swelling is marked.

Infection

This is not a common problem as the oral cavity heals rapidly and is relatively resistant to infection due to its extensive blood supply. A 7 day course of broad spectrum antibiotic after surgery is recommended.

Nasal discharge

Some mild nasal discharge can persist where nasal cavity is entered. Rarely requires treatment unless obviously purulent.

Mandiblectomy and Maxillectomy in Cats

These procedures can be performed in cats with the same techniques as dogs. However surgery is often more difficult as tumours are often more extensive at diagnosis relative to the size of the maxilla and there is less pendulous lip tissue to reconstruction defects compared to the dog.

Cats also tolerate these procedures less well than dogs. Following mandiblectomy 73% of cats were inappetant following surgery. This usually improves over weeks rather than days. Approximately 10%

of cats never ate voluntarily again after surgery. Grooming problems were also reported in 23% of cats.

On this basis cases should be carefully selected and owners carefully counselled. A feeding tube should be placed post surgery and maybe required for several weeks following surgery.

Facial Reconstruction Techniques

Facial wounds requiring reconstruction can result from bites, trauma particularly dragging and abrasion and wide resection for tumours. The aim of reconstruction of facial wounds is to maintain function of the mouth, eyes and nares with reasonable cosmetic result. Compared to humans the need for cosmesis comes secondary to function and simplicity. We are aided in reconstruction of the face by the large amounts lax cheek tissue and skin seen in many breed of dogs and the abundant blood supply. This blood supply allows for skin flaps with narrower bases than would often be used elsewhere in the body.

We have a variety of techniques for closure of wounds on the head particularly using skin flaps. Free skin grafts are rarely used in this location due to the difficulties in immobilising the graft following surgery

Reconstruction options

Primary closure

Due to the abundant skin and cheek tissue in many breeds of dog surprising large defects can be closed by primary closure. The cheek is closed in 2 or 3 layers and the commissure can be advanced if required. Care should be taken with primary closure near the eye not to affect eyelid function.

Advancement Flaps

Advancement flaps are often used to reconstruct the upper or lower lip. Upper and lower labial advancement flaps can be created. Care should be taken to preserve the labial artery supply to these flaps if possible. Some distortion of the nares can be seen due to tension with upper labial advancement flaps however this usually reduces over 1-2 weeks as the tissues stretch.

Buccal Rotation Flap

This flap is used to reconstruct larger defects of the upper lip. It results in advancement of the commissure.

Transposition skin flap for upper labial and buccal replacement

This flap is used for reconstruction of large defects of the upper lip where there is no mucosa available. The flap is folded on itself so skin is inside the mouth. Although skin is adequate reconstruction using mucosa is preferable.

Axial Pattern flaps

Three axial pattern flaps have been developed that can be used for reconstruction of larger skin defects on the head. There are experimental studies detailing these flaps but limited reports of clinical use of these flaps in the literature. As with all axial pattern flaps meticulous surgical technique is required to avoid damaging the direct cutaneous artery during surgery.

General principles of axial pattern flaps

- Precisely mark flap with reported anatomical description.
- Elevate flap deep to any superficial facial muscles.
- Handle flap as little as possible. Use stay sutures to handle.
- Care to avoid artery when dissecting near base of flap.
- Do not suture under flap only at edges

- **Facial Artery Flap**

This can be used to reconstruct defects of the orbit, lateral and rostral nasal regions of the maxilla.

The flap base of the flap includes the commissure of the lip and the lower labial margins. The dorsal margin is the ventral zygomatic arch and the ventral margin is the ventral edge of the mandible. The flap length is to the vertical ear canal.

- **Superficial Temporal Artery Flap**

This can be used to reconstruction defects of the maxilla and maxillo facial area.

The base of the flap is at the level of the zygomatic arch with the cranial margin border of the orbital rim and the caudal at the caudal edge of the zygomatic arch. The maximum length is dorsal orbital rim of the contra lateral eye.

- **Caudal Auricular Artery Flap**

This can be used to construct the caudo dorsal part of the skull, the orbit and the ventral mandible.

The base of the flap is the lateral wing of the atlas. Two parallel incisions are positioned in the central third of the lateral cervical region. The extent of the flap is the scapula.

Precise anatomical descriptions are available in most surgical text books

Further reading

Reconstructive surgery and wound management of the dog and cat Jolle Kirpensteijn and Gert ter Haar Mason Publishing 2013.

Atlas of small animal wound management and reconstructive surgery Michael Pavletic Wiley Blackwell 2010.