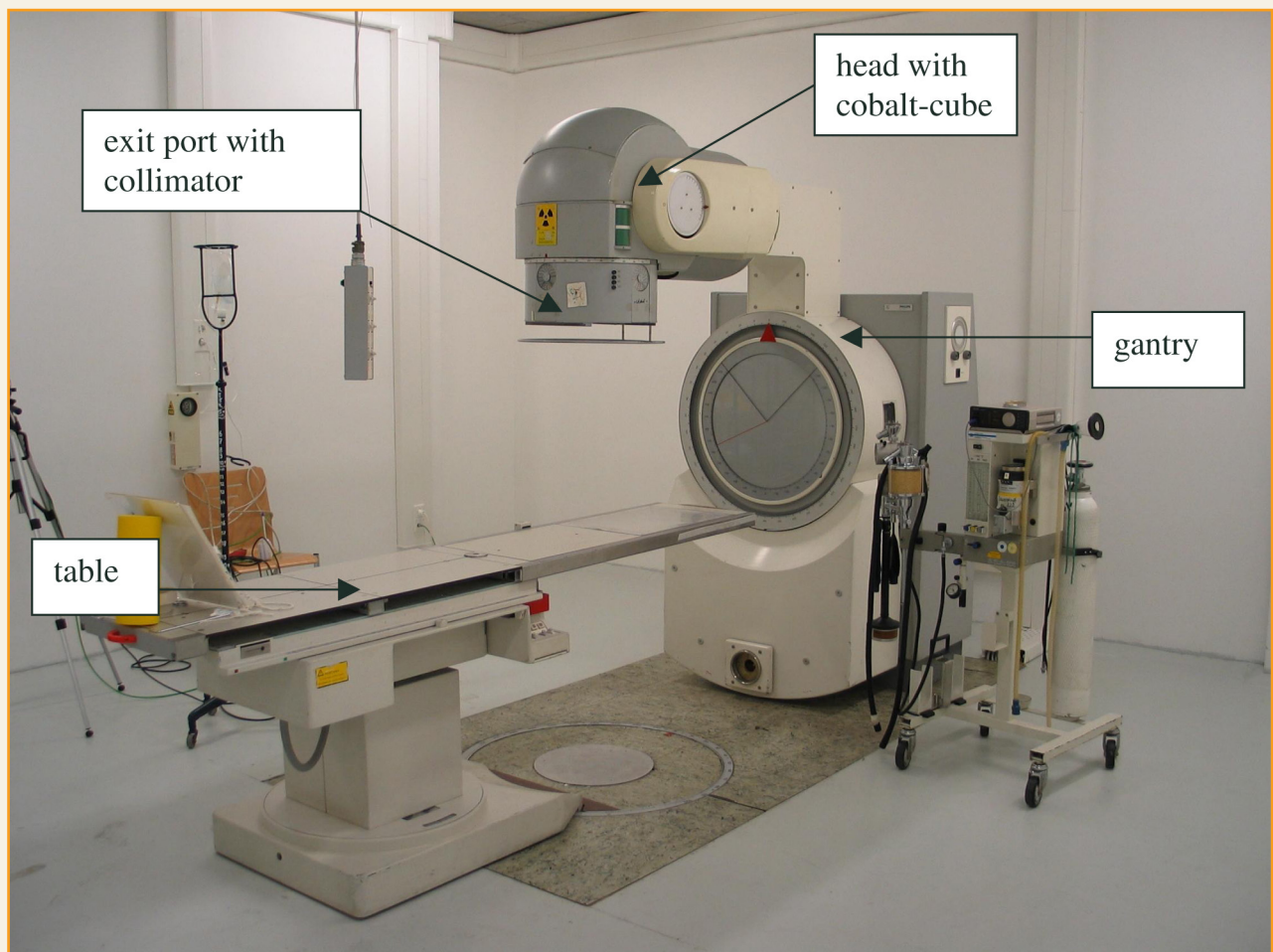


Bettina Kandel

Like surgery radiotherapy is usually a localized type of treatment. Today it is more readily available for the treatment of cancer in companion animals and many clients are well informed about the treatment options via internet.

There are different types of radiotherapy machines which are used to treat dogs and cats. External beam radiation therapy means that the ionising rays are delivered to the patient by a source placed outside the patient. The machines most commonly used in veterinary medicine are cobalt60-facilities, linear accelerators and orthovoltage units.

In our clinic we work with a cobalt60-machine.





Cobalt machines use high energy rays produced by a small (usually 2 cm) radioactive cobalt60-cube placed inside the head of the machine. In “off”-position the cube is deep inside the head. When the machine is turned “on”, the cobalt is moved over an exit port and the beams are directed on the patient. The collimator at the exit port allows the use of different square and rectangular field sizes between 3,5 x 3,5 cm and 32 x 32 cm. The patient is placed on the table, with the part intended to be irradiated lying under the head. The head can be moved by means of the gantry to deliver the beam from different positions.

Animals need to be under anaesthesia for radiation therapy as they are not allowed to move at all during the radiation session. They usually receive diazepam and propofol for induction, are intubated afterwards and maintained under anaesthesia by inhaling isoflurane/o₂ or sevoflurane/o₂.

When the machine is turned “on” nobody except the patient is allowed to be in the room. Cameras and acoustic signals are used to keep the patient under surveillance. If the patient is not stable under anaesthesia it is possible to interrupt the radiation at any time to examine the patient.

Aim is to deliver as much dose as necessary and possible to the tumour and to spare the surrounding healthy tissues as much as possible in order to achieve maximum tumour control and minimize the risk of side effects. The total dose has to be split in several small portions called fractions. The dose is measured in Gray (Gy).

Depending on tumour histology and treatment goal we use different protocols.

	curative protocols	palliative protocols
intent	<ul style="list-style-type: none">tumour control(cure)	<ul style="list-style-type: none">pain reductionimprovement of functiontumour control
fraction number	10 - 21	3 – 6
total dose in Gy	48 - 63	5 - 36
advantages	<ul style="list-style-type: none">longer tumour controlsome cures	<ul style="list-style-type: none">fewer side effectsless expensiveless time consuming for owner and animal
disadvantages	<ul style="list-style-type: none">more side effectsmore expensivemore time consuming for owner and animal	<ul style="list-style-type: none">shorter or no tumour control

Radiotherapy can be used for a wide variety of tumours. In some cases radiation is applied alone, sometimes it is used after or before surgery or in conjunction with medical therapy.



Particularly where tumour masses are in close proximity to sensitive organs special imaging devices like computed tomography (CT) scans are required to see the exact extent of the tumour and then plan the radiotherapy.

Localized feline and canine head and neck tumours are frequently treated with irradiation, since surgical resection in these areas may be impossible or incomplete. Various types of oral, nasal, aural, brain, thyroid and skin tumours can be treated in dogs and cats.

Tumours of the nasal cavity

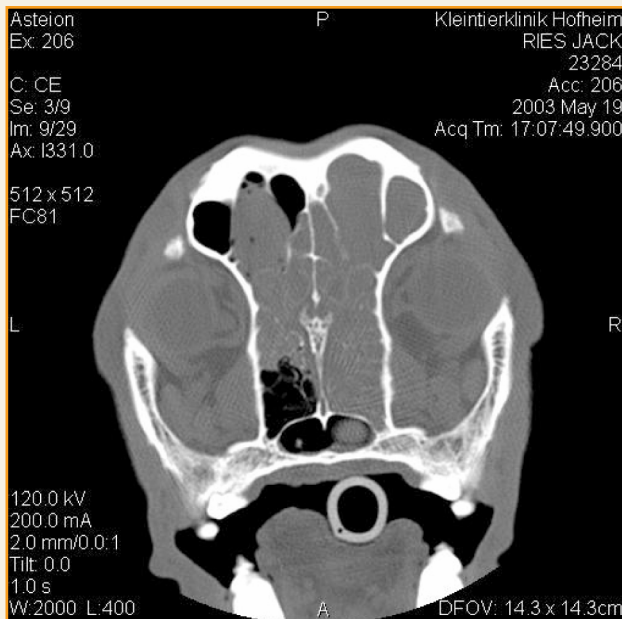
Tumours in this location are frequently found in older dogs and cats and the majority is malignant. Clinical signs are progressive or intermittent nasal discharge and/or nasal bleeding (epistaxis), difficulty in breathing, sneezing, snorting and facial deformity. Advanced imaging techniques like CT or magnetic resonance imaging (MRI) and biopsy are best way to confirm the clinical suspicion. Therapy of choice is radiation therapy with or without chemotherapy. A recommendation of a curative or palliative protocol depends on tumour size and invasion and the patients' general condition. Even with palliative irradiation complete tumour remissions can be seen. In most cases it is not possible to heal the patient, but clinical signs disappear in the majority of animals.



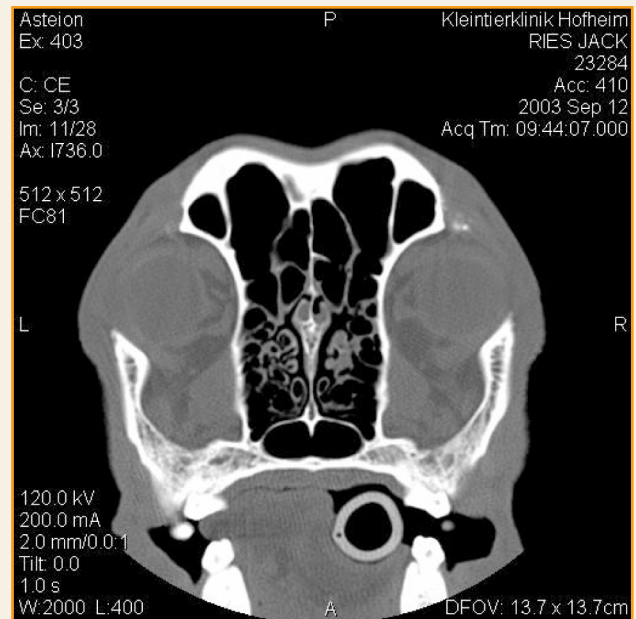
Cat with nasal lymphoma before treatment ...



...same cat at the end of radiotherapy



Dog with nasal adenocarcinoma before...



... and after radiotherapy

Tumours of the nasal cavity

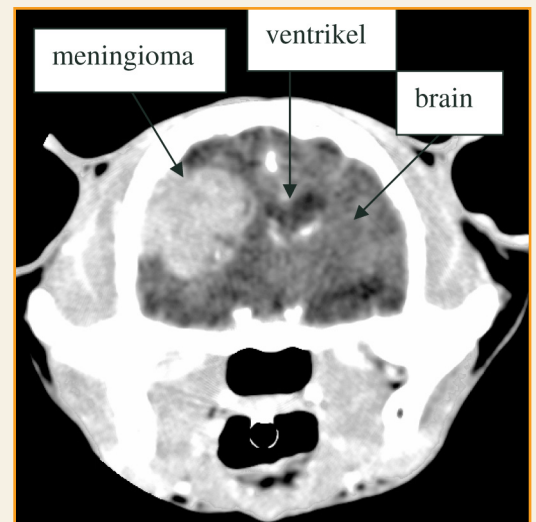
The oral cavity is a common site of neoplasia in dogs and cats. Approximately 40 % of canine tumours are benign (above all epulis, viral papilloma). There is a wide variety of malignant types (malignant melanoma, squamous cell carcinoma, fibro- and osteosarcoma). In the cat, the range of tumour types is more limited. Squamous cell carcinoma (malignant) accounts for 70 % of all tumours. Depending on the tumour location it can be hard to identify the mass early. Many patients present with signs of bad breath, excessive salivation, oral bleeding and dental problems.

Therapy depends on tumour type, location and invasiveness. To differentiate between the various histologic types it will be necessary to take a biopsy in the majority of cases.

Dogs with acanthomatous epulis (=basal cell carcinoma) can be healed with a course of primary curative radiotherapy. For dogs with squamous cell carcinoma irradiation can be used primarily or in conjunction with surgery. In cats this tumour is considerably more aggressive and resistant to radiotherapy. For fibrosarcomas and other oral sarcomas radiation can be used in combination with surgery in order to kill microscopic disease. Bulky sarcomas do not respond favourably to radiation. Malignant melanomas can be irradiated primarily or in conjunction with surgery. They are usually treated with 4 – 6 fractions once a week, what is called hypofractionated or coarse radiotherapy.

Brain tumours

Tumours affecting the brain are not very common, and they occur mainly in older dogs and cats. The clinical signs depend on the tumour localisation in the brain. Animals can be presented with seizures, circling and/or changes in behaviour for example. Advanced imaging techniques like MRI or CT will be required for diagnosis. Some institutes also have the ability to take biopsies to identify the histologic type. Therapy of choice depends on place of and way the tumour grows. Sometimes it will be surgery alone, especially in cats with peripheral growing meningiomas, in most cases it will be primary radiotherapy or a combination of surgery and irradiation.



Thyroid tumours

The vast majority of feline thyroid tumours are benign and secrete thyroid hormones. Therapeutic options include radiotherapy with radioactive ¹³¹iodine (injected s.c.), surgery and medical treatment.

Canine thyroid tumours are very often malignant. They tend to be locally invasive and can spread to the lung and regional lymph nodes. If complete surgical resection is not possible they can be primarily or adjunctive (after surgery) irradiated with reasonably good results. Chemotherapy is given to prevent or delay the occurrence of metastases.

Head and neck skin tumours

In many cases it is not possible to completely resect invasive tumours located at the head or distal parts of the limbs. Therefore radiotherapy is frequently needed to kill remaining microscopic tumour cells. Feline facial squamous cell carcinomas are good candidates for radiotherapy, they will be presented in a separate section.

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