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Manuscripts

1 Owners' perception of their dogs' quality of life during and after radiotherapy for cancer

2

3 Abstract

4

5 Introduction:

6 Owners are the decision makers about cancer treatment in dogs. There is lack of data regarding
7 owners' perception of their dogs' quality of life (QoL) during or after radiotherapy.

8 Objectives:

9 The aim of this study was to determine owners' perception of dogs' QoL before, immediately
10 after and 6-weeks after radiotherapy treatments for a variety of neoplasms and assess satisfaction
11 over their decision to treat.

12 Methods:

13 Questionnaires were given to owners whose dogs completed a radiotherapy treatment at a
14 Referral Radiation Oncology Centre. Questionnaires were given in three time points: before
15 treatment, on the last day of treatment and more than 6 weeks after the treatment was finished.
16 Owners were asked questions regarding their perception of radiotherapy and the QoL of their
17 pets before, during and after treatment with radiation therapy. QoL was scored from 1 (could not
18 be worse) to 10 (could not be better).

19 Results:

20 Seventy-one owners met the inclusion and exclusion criteria. Results showed that 6 weeks **or**
21 **more after** treatment, most owners were happy they had chosen to treat their dog (92%) and
22 would treat another pet again, if indicated (88%). Across the 3-time-points (pre-treatment, end-
23 of-treatment and 6-weeks after the last treatment), median QoL perception score was 9 (1 "could
24 not be worse" to 10 "could not be better").

25 Clinical significance:

26 Radiotherapy was well tolerated by owners and dogs. The great majority of clients were happy to
27 have pursued radiotherapy, would choose to do it again (if indicated), and would recommend it
28 to a friend.

29

30

31 Words: quality of life, radiotherapy, questionnaire, cancer, radiation therapy, dog

32

33

34 **Introduction**

35 Cancer is an important cause of death in pets, representing 25% of dogs over 2 years old, and
36 45% over 10 years old (Villalobos 2011 a). Being a common disease in humans, most owners
37 would have had personal experience of either a family member or friend that has been affected
38 by cancer. It has been described as one of the main concerns in owner's minds in respect of
39 quality of life (QoL) and health of their pets (Withrow et al 2013).

40 In veterinary oncology, treatments have evolved in parallel with human oncology. The goal of
41 treatment in veterinary medicine tends to be QoL as well as tumour control or remission. QoL
42 seems an important consideration in decision-making for owners with pets diagnosed with cancer
43 (Moore 2011).

44 Radiation therapy has been used since the beginning of 20th century in veterinary medicine
45 (Whiteley and Kestenman 1991). It is an effective treatment option for many solid tumours in
46 dogs. The last two decades has seen it become more available in the United Kingdom and
47 several centres are offering it. It can be used for curative intent or palliatively (LaRue and
48 Gordon 2013). External beam radiotherapy is used to treat types of tumours such as nasal
49 carcinomas, sarcomas, brain tumours, oral tumours, thyroid and mediastinal neoplasia, spinal
50 cord and many others (LaRue and Gordon 2013). Side effects of radiation therapy can be divided
51 into acute (or early) and late side effects. Acute effects occur soon during or after radiation
52 therapy. They involve rapidly dividing tissues as skin, mucosa, epithelial structures of the eye
53 and intestine. Acute side effects can be unpleasant and distressing for some owners but usually
54 resolve quickly and are self-limiting (LaRue and Gordon 2013).

55 QoL in veterinary medicine has no worldwide accepted definition, however it has been
56 considered synonymous with welfare. (Wojciechowska et al 2005 c). Attempts to assess QoL
57 have been made in numerous studies in dogs and cats for various diseases including cancer
58 (Boland et al 2014; Giuffrida et al 2014; Hamilton et al 2012; Reynolds et al 2010; Mellanby et
59 al 2003). A scale for health-related quality of **life was** proposed for dogs with signs of pain
60 secondary to cancer. In this study, dogs with cancer had lower scores compared with healthy
61 dogs or dogs with dermatological disease (Yazbeck et Fantoni 2005). In 2011, Lynch *et al*
62 developed a questionnaire assessing health-related QoL in dogs and cats with cancer. It included
63 pets treated with chemotherapy, surgery, radiation therapy and no treatment. **However, to the**
64 **authors' knowledge, there is no "gold standard"** method to assess QoL in dogs (Belshaw 2015).
65 Owner perception of treatments and their pet's quality of life are equally important, but these
66 parameters are poorly described. QoL has been reported as an important factor in decision
67 making for non-cancer diseases in pets (Reynolds et al 2010). The influence of side effects seems
68 to be important on the owners' perception of quality of life (Slater et al 1996, Bowles et al 2010).
69 Owners are the principal decision makers about treatment options available to their dogs with
70 cancer. Given the lack of data regarding owners perception of their dogs' quality of life during or
71 after radiotherapy, the aim of this study was to determine owners' perception of quality of life of
72 dogs before, immediately after and 6 weeks after radiation therapy treatment for a variety of
73 neoplasms and assess their satisfaction with their decision to treat.

74 **Materials and Methods**

75 Questionnaires were given to all dog owners of patients that were starting radiotherapy (either a
76 palliative or a definitive course) for cancer at the Linear accelerator radiation facilities of the
77 xxxx between March 2014 and September 2015. **'Palliative' courses were defined as protocols**

78 involving few large fractions, whereas 'definitive' were defined as those involving more fractions
79 of a smaller dose per fraction (Nolan and Dobson, 2018). It should be noted that palliative
80 radiation is usually given to prolong life by improving tumour control as well as improve
81 perceived deficits in quality of life. Dogs undergoing protocols for bone cancer did not receive
82 questionnaires because the fractions given were given at irregular intervals, for analgesia only
83 with no expectation to have any impact on tumour control.

84 Questionnaires consisted of 3 parts: 1) before treatment has started, given out by hand at
85 reception desk; 2) at the end of treatment, given out by hand at reception desk; 3) at least 6
86 weeks after the end of treatment, by hand or posted. Cases starting radiotherapy were identified
87 as they started treatment.

88 Dogs that did not complete the course of treatment, were dead less than 6 weeks after treatment
89 or received chemotherapy drugs simultaneously to radiotherapy were excluded from the study.

90 Owners that only answered the first part of the questionnaire and not the second or third were
91 also excluded.

92 Owners that missed the first questionnaire but answered the second and or third were included in
93 the study.

94 Data regarding patient (age, breed), body weight, disease, presence of metastatic disease,
95 previous treatments, area treated with radiation therapy, number of fractions and total dose
96 received, radiotherapy protocol type, presence of acute side effects were collected retrospectively
97 from files.

98 Grading of acute side effects was classified by the first author retrospectively, based on the
99 description of the side effects, using the VRTOG scale (La Due and Klein 2001).

100 Palliative protocols included following protocols: 4 weekly fractions (8 Gy each to a total of 32
101 Gy), 6 weekly fractions (6 Gy each to a total of 36 Gy) and “Quad shot” protocols (4 x 4 Gy
102 fractions given over 2 days repeated once a month for a maximum of 3 months).
103 Definitive protocols were protocols of daily fractions (15 to 20 daily 2.5-3.2 Gy fractions up to
104 50 Gy total dose).

105 The decision to treat and protocol chosen (palliative or definitive) was decided in the
106 radiotherapy referral consultation between the radiotherapy clinician and the owner considering
107 the type of tumour, stage of the disease and intent of treatment.

108 Patients receiving palliative treatments went home between treatments, except dogs undergoing a
109 “quad shot” palliative protocol stayed overnight between treatments. Patients undergoing
110 definitive protocols were hospitalized, either for the full treatment or during week-days, going
111 home for weekends.

112 Irradiated sites were grouped in the following categories: “brain”, “nasal”, “oral and neck”,
113 “perineal” and “skin/subcutis/intramuscular (skin/sc/im)”.

114 Questionnaires included questions regarding: Previous experiences with RT, previous feelings
115 about RT, Quality of life perception before, during and 6 weeks after RT (using a Likert scale 1-
116 10; 1- could not be worse and 10- could not be better), proportion of good days and bad days
117 before, during and after RT, type of hospitalization, feelings about having treated pet with RT, if
118 they would ever treat a pet again or if they would recommend it to a friend if indicated for their
119 pet.

120 The questionnaire was developed based on a similar questionnaire performed for cats receiving
121 chemotherapy (Tzannes et al 2008).

122 The project was approved by the Ethical Committee of the Institution.

123 Statistics used were mainly descriptive given the mostly subjective nature of the questionnaires.
124 Software used include Microsoft Excel and Statistical Package for Social Sciences (SPSS) v.23
125 for Windows.

126 **Results**

127 Eighty owners met the inclusion criteria for the questionnaires.

128 **Nine dogs were excluded from the study: five owners only answered the first part of the**
129 **questionnaire and no further, three dogs did not complete treatment or died less than 6 weeks**
130 **after treatment and one dog received concurrent chemotherapy.**

131 Dogs that did not complete the full radiation treatment (1 dog) or were not alive by 6 weeks post
132 treatment (2 dogs) were excluded. The dog that did not complete treatment died during treatment
133 with worsening of neurological signs. This dog was having RT for a brainstem tumour and it was
134 impossible to determine if death was due to treatment or progressive disease. Two dogs that
135 were not alive at 6 weeks after treatment due **to suspected progressive** disease (one nasal tumour
136 and one brain tumour) . No post-mortem was performed for any of the dogs. The authors
137 excluded **these** cases as they could not be assessed on the second and/or third timepoint and from
138 an ethical point of view.

139

140 Seventy one owners met the inclusion criteria and were included in the study. From those, sixty-
141 five owners answered the first part (before treatment), 54 owners answered the second part (at
142 the end of treatment) and 50 owners answered the third questionnaire (at least 6 weeks after
143 treatment). Twenty nine owners answered all three questionnaires.

144 The third part of the questionnaire was answered a median of 22 weeks after the end of treatment
145 (range 5-65 weeks).

146

147 *Characterization of population*

148 Breed, age, gender and body weight of dogs included in the study are described in Table 1.

149 Seventy-two tumours were present in 71 dogs. One dog was treated simultaneously for two

150 cancers in two different locations (a cutaneous mast cell tumour and a subcutaneous soft tissue

151 sarcoma). **The most common** diagnoses were mast cell tumours (22.2%), soft tissue sarcomas152 (20.8%) and **oral** melanomas (13.9%) (Supplementary information – Table A). The most

153 commonly treated area was the group: “skin, subcutaneous and intramuscular” (skin/sc/im) (

154 45.8%). Definitive protocol treatments were more common (58.3%) than palliative.

155 (**Supplementary** Information – Table A).

156 Protocols delivered are described in Table 2. For the definitive protocols the median dose per

157 fraction delivered was 3 Gy (range 2.5-3.2) for a median number of fractions of 16 (range 15-20)

158 and a median total dose delivered of 48 Gy (range 48-51).

159 For the palliative protocols the median dose per fraction delivered was 8 Gy (range 4-8), for a

160 median number of fractions of 4 (range 4-12) and a median total dose delivered of 32 Gy (range

161 32-48).

162 Most dogs had previous surgery (67.6%) and no previous chemotherapy (93%) before the

163 radiation treatment. Only 11.3% of dogs had recognized regional lymph node metastasis at the

164 time of treatment. No dogs had recognized distant metastasis.

165

166 *Characterization of acute side effects*

167 It was found that 59 dogs had acute side effects reported (Table 3), representing 83.1% of dogs.

168 Seventy-four events were reported in the 59 dogs. The most common side effect reported were

169 related to the skin, representing 63.5% of the events . Of the skin side effects 25.7% were grade 1
170 on the VRTOG scale (LaDue et al 2001), whilst 39.2% and 28.4% were grade 2 and 3 events
171 respectively. Two thirds of the adverse events were related with definitive protocols (64.9%),
172 and one third with palliative protocols (35.1%).

173

174 *Questions related to “Previous experiences and owners’ feelings prior to radiation therapy*
175 *treatment”*

176 Only 21.5% of the owners that answered the first part of the prospective questionnaires had
177 previous experience with radiotherapy. Most owners heard about radiotherapy in pets from the
178 general practitioner veterinary surgeon (42.3%), whilst 28.2% heard at referral consultation.
179 When asked regarding their feelings, most clients that answered the questionnaire had not
180 previously thought about use of RT in pets (55.4%). Eighty-three percent of owners decided to
181 treat with RT because they felt it was the best therapy for their pet. The remaining either were
182 not sure, or another family member thought it was the best option or did not specify the reason.

183

184 *Questions related to Treatment*

185 From the data retrieved regarding the type of hospitalization (part-2 of the questionnaire), most
186 dogs (53.7%) were hospitalized during the week but went home for weekends, 9.3 % were
187 hospitalized for the full course and 37% were treated as outpatients, going home every day.
188 Seventeen part-2 questionnaires (24%) were unanswered.

189

190 *Questions related to “Perception of quality of life before, during and after treatment”*

191 Owners were asked on a Likert 10-value scale (1- could not be worse and 10-could not be better)
192 regarding their perception of their dogs' QoL (Table 4).

193 The median QoL score before cancer was diagnosed was 10 (range 7-10) and before RT
194 treatment was 9 (range 4-10), based on a total of 65 owners' responses(questionnaire one).
195 During treatment, the median QoL reported remained 9 but the range was 2-10 based on a total
196 of 49 owners as 5 owners of animals that were hospitalized for the full length of treatment did
197 not answer this question as they were not with their pets during the hospitalization period. More
198 than 6 weeks after treatment, the median QoL was also 9 with a range of 4-10 (from a total of 50
199 questionnaires). Figure 1 shows the QoL scores of palliative and definitive protocol groups,
200 separately.

201 Looking at a qualitative perception of good and bad days, before radiotherapy treatment 63.1%
202 of owners thought their dogs had good days all the time (with no bad days), and 24.6% thought
203 their dogs had more good than bad days (table 4).

204 During treatment, 44.9% thought their dogs had good days all the time and many owners
205 (40.8%) still considered that their dog was having more good than bad days. Only one owner
206 thought that their dog was having bad days all the time and one said that it was having more bad
207 days than good days.

208 *Questions related to "owners feelings post-radiation therapy treatments"*

209 From part 3 of the questionnaire, when asked regarding their feelings after radiotherapy
210 treatment (table 5), most dog owners (92%) were happy that they chose radiotherapy. Four
211 owners (8%) were not sure about their feelings.

212 Most owners said that they would choose radiotherapy again if they had another pet with cancer,
213 and it was indicated (88%). However, 6 owners (12%) did not answer this question on the third
214 questionnaire.

215 Six weeks after treatment, most owners (96%) supported the use of RT in pets and if a friend's
216 pet needed RT they would recommend it (92%).

217 **Discussion**

218 To the author's knowledge, there are no validated questionnaires for evaluation directly or
219 indirectly (proxy-related) QoL of dogs with cancer undergoing RT. The individual characteristics
220 of this type of treatment with frequent hospitalization and frequent general anesthetics for each
221 fraction makes it different from most treatment modalities.

222 A previous study tried to address owners' perceptions of veterinary radiotherapy treatments in a
223 new radiotherapy centre in Sweden (Denneberg and Egenvall 2009). It was a single retrospective
224 questionnaire obtaining information on owners' perceptions and experiences, when choosing to
225 have radiotherapy (RT) for their dogs. All owners thought it worth the effort and all but one
226 would have done it again if needed. (Denneberg and Egenvall 2009)

227 There are no published studies regarding owners' perception of quality of life for dogs
228 undergoing radiotherapy treatments in United Kingdom. The aim of our study was to clarify this
229 as well as prospectively assess their satisfaction to treat.

230 Our results show that, most owners were happy that they had chosen to treat their dog with
231 radiotherapy (85.2%) and would treat another pet again, if indicated (88.9%).

232 When RT treatments were considered all together, the median QoL scores were similar across
233 the 3-time-points studied (pre-treatment, during treatment and more than 6-weeks after the last
234 treatment), with a median QoL of 9.

235 As expected, both the median and first quartile of QoL perception score more than 6 weeks after
236 RT was lower in palliative than in definitive treatments. It also seems that there may be a trend
237 towards improvement of QoL perception with definitive treatments but the numbers are too
238 small for accurate conclusions.

239 **Considering** QoL scores of palliative intent and definitive intent protocol groups, separately,
240 QoL scores **six weeks after palliative treatments were lower than before treatment, showing a**
241 **possible negative impact from treatment. However, this may be explained by the fact that dogs**
242 **chosen to have a palliative treatment may have earlier disease progression than the definitive**
243 **group. However, this may also represent side effects considered unacceptable by some owners,**
244 **considering the palliative nature of treatment.**

245 The present study has showed a high QoL perception score from the beginning to the end of the
246 study, independent of the type of protocol. This may represent a selection bias, since owners that
247 choose RT for their pets may be more motivated and have more expectations **and could be**
248 **subject to a proxy placebo effect.** Owners of dogs with poor baseline QoL scores may not be so
249 keen to undertake such a treatment due to its costs and time implications.

250 **Additionally , a selection bias may be present as that most dogs treated had**
251 **skin/subcutaneous/intramuscular neoplasia and it may be postulated that the related RT acute**
252 **side effects may be different in other locations.**

253 A recent oral presentation presented at the annual congress of British Small Animal Veterinary
254 Association congress in 2015 (Serras et al 2015) presented some preliminary data retrieved from
255 retrospective questionnaires given to owners of dogs that underwent radiation therapy in UK.
256 Results about quality of life perception and satisfaction to treat were similar to the ones in this

257 study and supported this study's findings that most owners were happy with decision to treat and
258 would do it again if needed.

259 In the present study, there was a wide variation on tumour types and areas treated and this makes
260 it difficult to see if there was any correlation between type of disease, area treated, type of
261 treatment, type of side effects and QoL score perception. One particular point of interest would
262 be to evaluate the effect of acute adverse effects on QoL scores for each type of tumour or for
263 each area treated individually. A further multi-institutional study would be useful to assess this.

264 Dogs with bone neoplasia were excuded from this study because when the study was started,
265 these cases were receiving a variable number of fractions for pain relief only and not as a defined
266 protocol, making it difficult to decide when questionnaire 2 and 3 were due. It would be
267 interesting to perform a QoL assessment for this specific group in order to define whether there is
268 a QoL benefit.

269 Eighty percent of cases of this study had acute side effects reported. It would have been
270 interesting to collect adverse event data concurrently as well as standardize recording, as
271 recommended previously, to avoid underestimation or suboptimal collection (Giuffrida et al
272 2016). Another future recommendation would be to include a questionnaire with more objective
273 measures of quality of life, to be assessed by the radiation oncologists and/or nurses alongside
274 the owners' perception and compare them. This information may also detect more subtle changes
275 during hospitalization and treatment.

276 It would have been interesting to try to understand whether the hospitalization type affected the
277 QoL score perception. One can postulate that longer hospitalization can lead to
278 institutionalisation of the animal due to kennelling and thus a decreased quality of life, as has
279 been reported in previous studies (Boland et al 2014). On the other hand, it is likely that when

280 the dog is at home the owners may be more aware of possible side effects secondary to treatment
281 and/or general anesthesia.

282 We excluded one dog that received cytotoxic drugs during radiotherapy since this could interfere
283 with the side effects of radiotherapy. It would be interesting to know whether treating
284 simultaneously with chemotherapy and radiotherapy affects the severity of side effects
285 experienced by the dogs and the QoL perception by owners.

286 Unfortunately, only 29 owners answered to the 3 time-point questionnaires. First and second part
287 questionnaires were answered mainly while owners were waiting in reception. Some first and
288 second part questionnaires may have been missed due to unplanned admissions and discharges or
289 other uncontrolled variables. The third questionnaire was given at the review consultation or by
290 post and therefore, it was more dependent on the cooperation of the owners. Other studies have
291 similarly found difficulties in retrieving some questionnaires from owners (Tzannes et al 2008,
292 Bowles et al 2010). The time length between the end of treatment and the answer of the 3rd part
293 of the prospective questionnaire might have affected the QoL perception scores. Owners may
294 forget the more negative experiences (Tzannes et al 2008).

295 To the authors knowledge, there were no owners **that were unwilling** to answer the
296 questionnaires, but the lack of response on the third questionnaire (21 owners in 71) could
297 represent some owners that were not willing to answer. This can correspond to some non-
298 respondent bias. **Five owners** only answered the first part of the prospective questionnaire and
299 we are not aware why they did not answer second and third part. This can again represent bias. It
300 has been suggested that the non-responders may represent the ones that had a worse experience
301 (Bowles et al 2010; Edwards et al 2002). In our study the questionnaire was not anonymous as
302 we needed to link the grade of adverse event with the owners' answers. An anonymous

303 questionnaire may increase the chance of negative answers. Exclusion criteria included dogs that
304 did not complete the course of treatment or died less than 6 weeks after treatment. This may
305 represent bias since these owners may be upset and more likely to give negative answers. It
306 would be interesting to know how these owners would have responded but ethically it was not
307 considered correct to contact them further.

308 This study only includes a referral population, which will involve selection bias regarding the
309 type of owners, type of cases and the individual cases that the referring general practitioner
310 believes are suitable for referral. These owners tend to be more motivated and committed and
311 usually want to proceed with more advanced treatment techniques and/or may have more
312 resources. This was suggested in another similar study (Tzannes et al 2008). An interesting study
313 would be to assess the reasons behind why some owners decline referral oncology consultation
314 and radiotherapy.

315 Retrospective studies may have recall bias, since owners would have to recall the information.

316 This study was planned to minimize recall bias through a real-time questionnaire. However, the
317 third part of the questionnaire may be subject to recall bias. Previous studies had shown that
318 recall bias may reduce the negative answers and have an optimistic effect (Edwards et al 2002).

319 In conclusion, this study concludes although half of the owners had not previously thought about
320 the use of radiotherapy, 6 weeks or more after treatment more than two thirds of owners who
321 elected to pursue this treatment were happy with the decision to treat and would treat another pet
322 with RT, if indicated. After their experience, over 90% of owners supported the use of RT in pets
323 and would recommend it for a friend's pet if indicated.

324 Further studies are needed to assess the impact of individual type of tumour and individual areas
325 treated on QoL and would allow better correlation with side effects and, in turn, allow

326 assessment of their influence on QoL scores. This study was an important preliminary study to
327 help future owners with their decision whether to treat or not with radiotherapy. QoL assessment
328 tools should also be included in future radiotherapy studies as primary end-points.

329

330 **Conflict of interest:** No **conflict** of interest have been declared.

331

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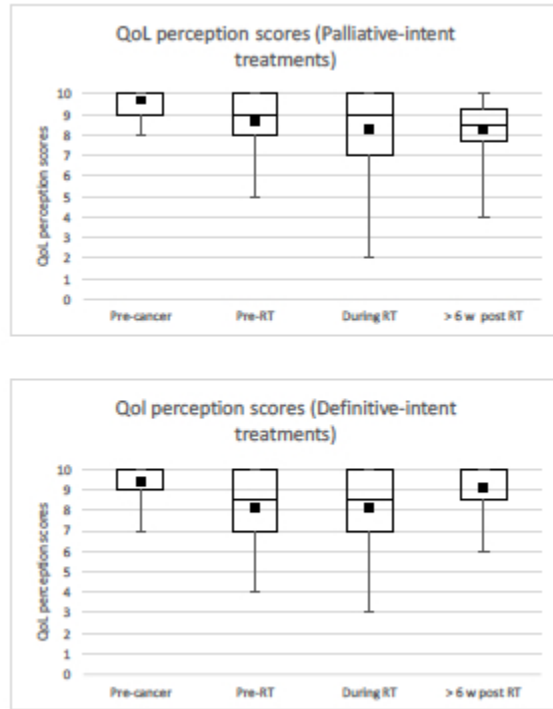


Figure 1 – Box and whisker plot on Quality of life perception scores prior to cancer diagnosis, pre-RT treatment, during RT treatment and over six weeks post treatment in palliative intent and definitive intent protocols.

103x130mm (72 x 72 DPI)

Table 1 – Summary of breed, age, gender and body weight of 71 dogs included in this study

Breed (Frequency (%))	
Labrador Retriever	19 (26.7)
Crossbreed	9 (12.7)
Various other breeds (less than 4 dogs per breed)	43 (60.6)
Age (years)	
Median	8.4
Range	1.8-12.4
Gender (n(%))	
Male neutered	36 (50.7)
Male entire	3 (4.2)
Female neutered	26 (36.6)
Female entire	6 (8.5)
Body Weight (kg)	
Median	26.3
Range	4.2-44

Table 2 - Description of the 72 radiotherapy protocols delivered in the 71 dogs included in the study

Protocols included in the study	Nº fractions	Dose per fraction	Total dose	Time period of delivery	Nº cases included
Definitive intent protocols	20	2.5 Gy	50 Gy	daily	14
	16	3 Gy	48 Gy	daily	26
	17	3 Gy	51 Gy	daily	1
	15	3.2 Gy	48 Gy	daily	1
Palliative intent protocols	4	8 Gy	32 Gy	weekly	24 ¹
	6	6 Gy	38 Gy	weekly	4
	8	4 Gy	32 Gy	4 fractions in 2 days repeated one month after ("quad shot")	1
	12	4 Gy	48 Gy	4 fractions delivered in 2 days; repeated one and two months after ("quad shot")	1

¹ one dog was treated simultaneously for 2 neoplasias in two different locations, both with a palliative intent protocol

Table 3 – Summary of acute side effects that occurred in 71 dogs included in the study; classified using VRTOG guidelines (LaDue et al 2001), from dogs clinical files.

Type of Adverse Event	Grade 1 n (%)	Grade 2 n (%)	Grade 3 n (%)	No grade	Total n(%)	Total of events (Definitive intent protocols)	Total of events (Palliative intent protocols)
Skin/hair	16 (34)	23 (49)	8 (17)	-	47 (63.5)	32	15
Mucous membranes/oral cavity	2 (11.1)	4 (22.2)	12 (66.7)	-	18 (24.3)	10	8
Eye	1 (33.3)	1 (33.3)	1 (33.3)	-	3 (4)	2	1
CNS	0	1 (100)	0	-	1 (13.5)	1	0
Others	-	-	-	5	5 (6.8)	3	2
Total events Each grade	19 (25.7)	29 (39.2)	21 (28.4)	5 (6.8)	74 events	48 events	26 events

CNS: Central nervous system; n: frequency of events

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Table 4 – Summary of answers on qualitative Quality of Life perception prior, during and post radiotherapy treatment based on first, second and third part of questionnaire;

	Before RT treatment	During RT treatment	More than 6 weeks after treatment
Qualitative perception n (%)			
Good days all the time	41 (63.1)	22 (44.9)	n/a
More good than bad days	16 (24.6)	20 (40.8)	n/a
Equally good and bad days	2 (3.1)	4 (8.2)	n/a
More bad than good days	0	1 (2.0)	n/a
Bad days all the time	0	1 (2.0)	n/a
Other	1 (1.5)	0	n/a
Unanswered	5 (7.7)	1 (2.0)	n/a
Number questionnaires retrieved	65	54	50
Number questionnaires considered	65	49 ¹	50

¹ 5 dogs hospitalized for full time, so owners were not asked to assess QoL perception during hospitalization; n frequency of answers; n/a non applicable; RT - radiotherapy

Table 5 – Summary of answers on owners feelings post radiotherapy (RT) treatments

	Immediately after treatment	> 6 weeks after treatment
	Frequency (%)	Frequency (%)
Feelings about having treated pet with RT		
Happy that chose it	46 (85.2)	46 (92)
Not sure about feeling	4 (7.4)	4 (8)
Regret choosing RT	0	0
No answer	4 (7.4)	0
If had other pet with cancer, would choose RT, if indicated		
Yes	48 (88.9)	44 (88)
No	0	0
No answer to this question	6 (11.1)	6 (12)
Feelings about RT in pets		
Support the use	47 (87)	48 (96)
Don't have strong feelings either way	3 (5.6)	1 (2)
Object the use	0	0
Unanswered	4 (7.4)	1 (2)
Recommendation of RT to a pet's friend, if indicated		
Yes	-	46 (92)
No	-	0
Unanswered	-	4 (8)
Total of questionnaires	54	50

Table 1 – Summary of diagnosis, area treated and type of treatment for 71 dogs included in the study.

Diagnosis	Site group	Total of cases (n (%))	Palliative intent protocol (n (%))	Definitive intent protocol (n (%))
Acanthomatous ameloblastoma	Oral/neck	3 (4.2)	0	3
Anal Sac adenocarcinoma	Perineal	3 (4.2)	0	3
Carcinoma	Nasal	4(5.6)	1	3
Extra-axial brain mass¹	Brain	6 (8.3)	0	6
Frontal sinus tumour¹	Nasal	1 (1.4)	1	0
Haemangiosarcoma	Skin/sc/im	1 (1.4)	1	0
Histiocytic sarcoma	Skin/sc/im	-	-	-
Infiltrative lipoma	Skin/sc/im	2 (2.8)	0	2
Intra axial brain mass¹	Brain	2 (2.8)	1	1
Lymphoma (epitheliotropic)	Oral/neck	3 (4.2)	3	0
Macroadenoma	Brain	-	-	-
Mast cell tumour	Skin/sc/im	16 (22.2)	9 ²	7
Melanoma	Oral/neck	10 (13.9)	10	0
	Perineal	-	-	-
Meningioma	Brain	3 (4.2)	0	3
Pilomatrixoma	Skin/sc/im	-	-	-
Plasmacytoma	Oral/neck	1 (1.4)	1	0
Soft tissue sarcoma	Nasal	15	-	-
	Oral/neck	(20.8)	0	1
	Skin/sc/im		2 ²	12
Squamous cell carcinoma	Oral/neck	1 (1.4)	1	0
Synovial cell sarcoma	Skin/sc/im	-	-	-
Thyroid carcinoma	Oral/neck	1 (1.4)	0	1
Total		72 ²	30 (41.7%)	42 (58.3%)

¹ No histopathological diagnosis; ² one dog was treated simultaneously for 2 neoplasias in two locations; n frequency; sc subcutaneous; im intramuscular.