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## The need for further research regarding treatment strategies for canine prostate cancer

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Prostate cancer is a condition that is estimated to account for less than 1% of all canine cancers (Obradovich *et al.*, 1987). The prognosis for canine prostate cancer is currently very poor (Griffin *et al.*, 2018). Untreated animals have a life expectancy of around 1 month (Griffin *et al.*, 2018).

Medicinal treatment, surgery and radiotherapy have all been mentioned as treatment strategies for canine prostate cancer (Leroy and Northrup, 2009). However, it does not seem that a first line standard of care has been currently established.

Dogs diagnosed with prostate cancer are now often treated with non-steroidal anti-inflammatory drugs (NSAIDs), such as Meloxicam and Carprofen, and/or chemotherapy. In 2004, a retrospective study (Sorenmo *et al.*, 2004) found that animals treated with Piroxicam or Carprofen lived significantly longer than those not treated. Another retrospective study (Hazzah *et al.*, 2013) failed to show an objective response to a treatment regimen of Mitoxantrone and Piroxicam. A more recent study (Ravicini *et al.*, 2018) suggested that a combination treatment of NSAIDs and chemotherapy could improve quality of life (QoL) and survival in dogs with prostatic carcinoma. Prospective studies regarding the effectiveness of NSAIDs and chemotherapy in canine prostate cancer are rare. A randomized clinical trial comparing the effectiveness and complications of NSAIDs versus NSAIDs combined with chemotherapy could provide important insights. In case of positive results in one of the treatment arms, this trial could perhaps be used to formulate proposals for a standard first line treatment.

Prostatectomy is not usually seen as an appropriate treatment option for canine prostate cancer, in part because of the risk of urinary incontinence (Leroy and Northrup, 2009). Nevertheless, a 2006 prospective clinical study (Vlasin *et al.*, 2006) showed that dogs that underwent subtotal intracapsular prostatectomy survived on average 112 days. Animals treated with total prostatectomy only survived for an average of 19 days. However, in 2018, a retrospective case series in 25 dogs whose treatment included total prostatectomy (Bennett *et al.*, 2018) showed that the median survival time could be extended to 231 days. The authors reported that case selection could have influenced this outcome.

Despite these studies and other research, the efficacy and complications related to prostatectomy should be further elucidated. The effectiveness and complications of partial and total prostatectomy could be tested in more narrow indications. This will lead to a better understanding whether the risk/benefit balance of prostatectomy could be positive in certain settings. For example, a clinical trial could be performed to assess whether prostatectomy has an additional advantage in unmetastasized cancers. Its role in combination treatment with NSAIDs and chemotherapy should also be further investigated.

Radiation therapy has been proposed for pain management in case of skeletal metastasis and for tumor symptom relief (Leroy and Northrup, 2009). A study regarding therapeutic radiation was published in 1987 (Turrel, 1987). However, the achieved results were unsatisfactory while the side effects were severe.

In general, most of the current body of evidence regarding treatment strategies of canine prostate cancer consists of retrospective studies. Despite providing important information, these studies have some inherent drawbacks to their design and internal validity. As stated by several authors, prospective clinical studies should be performed to adequately assess the effectiveness of the currently available procedures. Based on the results from these trials, standard of care guidelines for this debilitating condition could be developed.

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