



Case Report: Nutritional Management of Canine Renal Insufficiency Utilizing a Home-Cooked Diet and Supplementation

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Abstract

Renal insufficiency is difficult to diagnose in the early stages due to delayed clinical presentation and significant blood value changes. However, dysfunction in the kidneys can lead to life-threatening changes in physiology. When renal insufficiency is suspected, it is important to utilize nutrition as a mode of intervention. This case report follows a canine patient aging between 13 to 17, reporting clinical changes and blood renal values after administration of an NSAID and possible escalation of renal burden. The case outlines an example of utilizing integrative veterinary medicine practices including a home cooked diet plan with supplementation to address signs of renal insufficiency and gastric ulceration, resulting in complete resolution of clinical signs including symptoms and blood measures.

Keywords: Renal insufficiency; Canine; Nutrition; Integrative veterinary medicine; Supplementation.

INTRODUCTION

Canine renal insufficiency is often managed with a low phosphorus and protein diet that is not ideal for long-term use [1,2]. This strategy is effective for its purpose of slowing progression but does not address the root cause of the renal burden. In this case, specific dietary modifications and supplementation were utilized to achieve the overall health of the animal including renal and gastric support. Upon initial presentation, the canine patient was in pain due to Intervertebral Disc Disease (IVDD) and was immediately prescribed a Non-Steroidal Anti-Inflammatory Drug (NSAID) to ameliorate pain. Soon after NSAID administration, the patient was showing clinical signs of renal insufficiency (e.g. adipsia, panting, shaking) as well as elevated creatinine and Blood Urea Nitrogen (BUN) values [3]. The use of functional whole foods and supplementation under veterinary supervision allowed discontinuation of NSAID use and recovery of renal burden as opposed to utilizing a commercial therapeutic diet.

CASE DESCRIPTION

Patient and case information

The patient is a female, spayed beagle mix that was born in 2007. At the time of this case report (2019-2024), the patient weighed 17 pounds. Upon presentation, the canine patient had been eating a complete and balanced commercial dehydrated diet since switching from commercial kibble in 2015. The dog did not have a history of renal issues prior to 2019. The patient, however, did have IVDD and was receiving regular acupuncture treatment. The patient owners sought medical attention from their local veterinarian, and the patient was put on a NSAID (carprofen; 25 mg BID) for back pain related to IVDD. It was suspected that the NSAID may have led to acute renal damage or an exacerbation

of underlying renal insufficiency. Consequently, clinical signs of adipsia, shaking, and panting were noted by the owners. Blood work revealed severe azotemia suggesting renal insufficiency, resulting in suspension of NSAID use. At this time, patient owners consulted the treating veterinarian, Dr. Decker, for nutritional assessment related to suspected renal damage and resulting insufficiency. Dr. Decker recommended transitioning to a homemade diet with supplementation (detailed below) to ensure a nutritionally balanced diet while addressing renal and gastric concerns. The dates of clinical significance and/or veterinary visits are outlined, detailing the progression of the case (Table 1).

Table 1: Dates of clinical significance, their relationship to the visit number in figure 1 and details regarding significance.

Visit #	Date of Significance	Details	Creatinine (mg/dL)	^BUN (mg/dL)
1	12/04/2019	Initial sign of increased BUN	1	64.9
2	5/05/2020	Started NSAID following visit to address IVDD pain	1.5	51
3	5/20/2020	Stopped NSAID; clinical signs of adipsia, shaking and panting	2.1	98
4	5/29/2020	Diagnostic imaging performed; SDMA*: 25; blood values are post IV fluid therapy	1.4	73
-	6/07/2020	Owner contacted treating veterinarian; started supplements; switched to home-cooked meals	N/A	N/A
-	10/01/2020	Added additional supplements to routine	N/A	N/A
5	11/16/2020	Monitoring of renal health/ decreasing blood renal values	2.3	58
6	2/22/2021	Monitoring of renal health/ decreasing blood renal values	1.8	57
7	2/07/2023	Monitoring of renal health/ decreasing blood renal values	1.4	38
8	4/05/2023	Monitoring of renal health/ decreasing blood renal values	1.5	26
9	2/10/2024	Monitoring of renal health; SDMA: 19	1.5	38

^ BUN - Blood Urea Nitrogen; * SDMA - Symmetric Dimethylarginine

Submitted: 10 September 2024 | **Accepted:** 14 September 2024 | **Published:** 19 September 2024

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Citation: Koziol S, Decker D (2024) Case Report: Nutritional Management of Canine Renal Insufficiency Utilizing a Home-Cooked Diet and Supplementation. JSM Vet Med Res 3: 5.



Clinical findings and timeline

Blood renal values were routinely monitored throughout the entirety of the case investigation. Fluctuation of these values was in line with factors such as NSAID administration (elevation in renal values), diet modifications, and supplement administration (normalization of renal values). Specific blood renal value (creatinine and BUN) changes over time are demonstrated (Figure 1). Ultrasound imaging was performed on 5/29/2020 after use of NSAID had been suspended for 9 days. The summary of diagnostic assessment was mild bilateral renal changes indicating inconclusive but suspected renal insufficiency.

- Added to home-prepared food ingredients to help ensure a well-balanced diet.

- Included calcium, magnesium, iron, strontium, sodium, manganese, phosphorus, potassium, and chromium.

L-glutamine

- Offers gastric lining support as gastric ulcerations (a common side effect of NSAID use) may contribute to the elevated BUN levels.

- A dose of 1.14 -2.28 grams daily was administered.

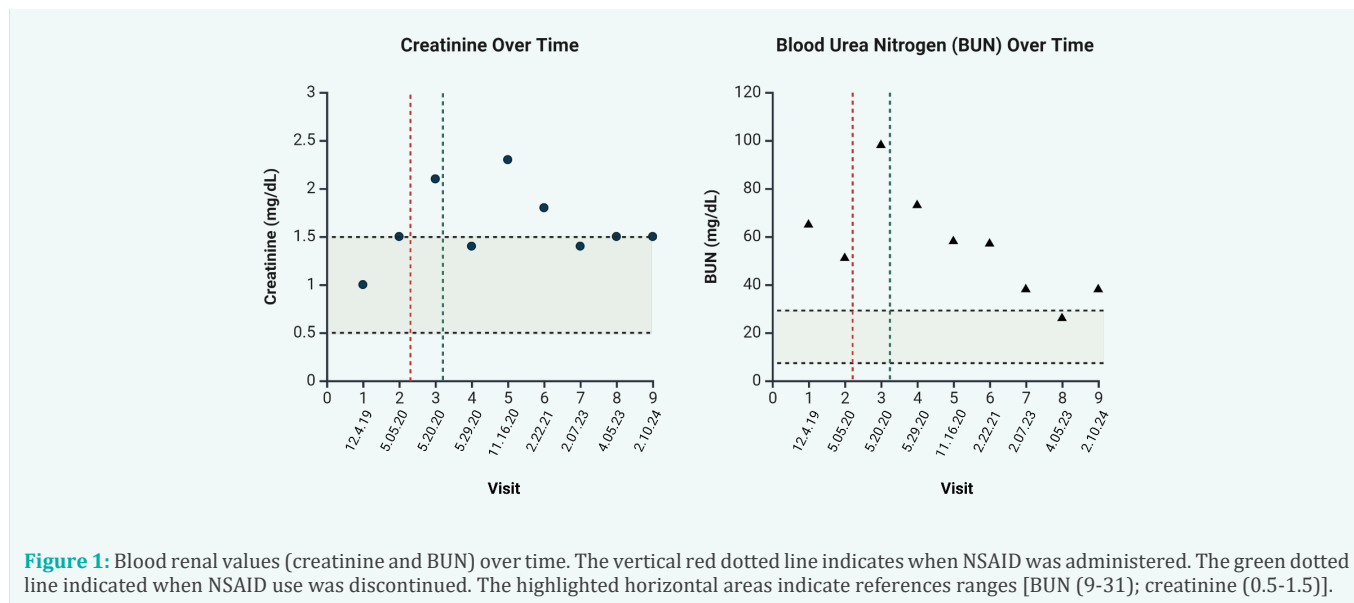


Figure 1: Blood renal values (creatinine and BUN) over time. The vertical red dotted line indicates when NSAID was administered. The green dotted line indicated when NSAID use was discontinued. The highlighted horizontal areas indicate reference ranges [BUN (9-31); creatinine (0.5-1.5)].

Therapeutic intervention

NSAID administration was immediately suspended upon identification of renal burden. In June of 2020, the beagle started on the following supplements as well as switched from a commercial dehydrated diet to home-cooked meals. The home cooked meal recommendation was 1/3 meat (rotation of beef, chicken, and turkey), 1/3 organic sweet potatoes with skins, and 1/3 blend of leafy greens (e.g. kale, spinach, swiss chard).

The following supplements were chosen for the following reasons:

Canine Renal Support (Standard Process)

- Provides support for the normal function of dogs' kidneys while also supporting essential systems related to renal support.

- The label recommended dose was administered based on body weight: 1/8 tsp BID.

Catalyn (Standard Process).

- Supplies multiple vitamins, antioxidants, and vital nutrients from whole food and other sources.

- The label recommended dose was administered: three tablets daily.

Herbal pain relief supplement.

- Included Arnica, Calendula, Echinacea, and Hypericum.

- Helped manage patient's chronic IVDD-related pain without pharmaceutical use.

Canine mineral supplement

In October of 2020, the following supplements were added to the patient's daily routine:

Renatrophin PMG (Standard Process)

- Contains bovine kidney PMG™ extract.

- One tablet BID was administered.

Rehmannia herbal supplement

- Bone and organ support with traditional use in kidney health.

- A dose of one 500 mg tablet BID was administered.

Patient owners continued to supplement Canine Renal Support, Catalyn and minerals as well as feed a primarily home cooked diet after complete resolution of clinical signs. Additionally, blood renal values decreased to a more acceptable range for an aging dog. The patient at 17 years old had notably lower BUN values than records show at age 13.

DISCUSSION

Kidneys are essential for many mechanisms throughout the body including maintenance of fluid and electrolyte balance, metabolic pH balance, conservation of nutrients, and excretion of waste [4]. Additionally, kidneys play a large role in endocrine functions including activation of vitamin D as well as hormone synthesis for blood pressure regulation and erythropoiesis. Dysfunction of the kidneys may lead to life-threatening disruptions in physiology [5].

Evidence is accumulating to support the connection between nutrition and renal health, with research linking certain whole foods to benefits beyond nutrition. Interventions such as these provide the greatest benefit when introduced at early stages of burden or distress.



They are not intended to cure, treat or prevent disease, but to support the overall health of the organs, facilitating healthy function. Additionally, impaired function from an acute kidney injury (e.g. pharmacologically induced) is more commonly reversible than unspecified chronic kidney insufficiency. As noted previously, this case describes a situation where an NSAID was administered to address IVDD pain, but the medication had implications for organs that may have already had underlying burdens or increased demand (kidneys, gastric mucosa). Renal burden is often undiagnosed due to delayed onset of clinical signs and abnormal bloodwork. However, understanding the state of the organs is essential for determining appropriate nutritional management [6].

In a situation of late-stage CKD, it may be necessary to utilize a commercially formulated therapeutic canine diet. These diets have been shown to be effective at managing kidney failure and extending the life expectancy of patients by mitigating risk factors and symptoms (e.g. phosphorus accumulation, proteinuria, and hypertension). These diets are not formulated to address the foundational health of the kidneys. However, managing these risk factors and symptoms becomes critical in late-stage renal failure, making these diets a very effective strategy [1,2]. There is a lack of research around early or acute renal burden support through nutritional efforts, but growing evidence in both human and animal research allows for a potential reflection of those benefits for canine renal health [7].

DIET AND SUPPLEMENTATION

The quality of a dog's daily dietary intake is crucial for its overall health and wellbeing. As is true with humans, recent research points to the benefits of feeding primarily minimally processed foods compared to foods cooked at high temperatures for long durations. Canine studies have revealed that there is a reduction in inflammatory cytokines, increase in endogenous antioxidant production, and improvement in skin and coat quality when consuming these lightly processed diets [8].

Researchers have gathered pre-clinical evidence of different whole foods to assess their impact on kidney health. Many of these studies investigate high doses and are aimed at treating or curing insufficiency on an extreme level. The extrapolation of this research to clinical use must be done thoughtfully and with the intention to support kidney's structure and function. However, this research can offer insight into how foods may impact kidney function on a mechanistic level and where supplementation may be incorporated into a treatment plan. For example, wheat germ oil has been investigated for its effects on renal health. Studies in murine models outlined benefits related to improved creatinine and BUN levels as well as renal antioxidant capacity [9-11]. Antioxidants, in general, have evidence of renal protection through ameliorating increased free radical production during renal burden [12]. Carrots, another whole food source of antioxidants, contain high levels of carotenoids, which have been shown to play a role in kidney health. β -carotene and lycopene are the predominant carotenoids found in kidney tissue [13]. β -carotene decreases in patients with mild to moderate kidney dysfunction and higher serum carotenoid levels were inversely associated with decline in kidney function [14,15]. A study identified benefits of beta carotene supplementation on acute renal damage through antioxidant capacity, reduction in systemic inflammation as well as decreased urea and creatinine concentration and improved clearance [16]. Kidney bean extract is also rich in phenolic compounds such as flavonoids, saponins, hydroxycinnamic acids, catechins, and anthocyanins that are widely considered to be dietary antioxidants [17]. In a murine model, cooked kidney beans at a high inclusion in the diet decreased serum urea, urine albumin and increased creatinine clearance as well as improved gene expression [17].

L-glutamine is an amino acid that has been extensively studied for its effects on gut health, specifically intestinal villi and mucosal integrity. The increases in overall GI tract health aids in preventing intestinal

hyperpermeability, an important aspect for systemic immune and organ health [18]. L-glutamine has been studied in murine models for its ability to aid in gastric ulcer protection and restoration [19,20]. Early research shows potential for glutamine to also aid in renal parameters of certain individuals [21]. Rehmannia is an herb traditionally used for a wide range of ailments and contains bioactives: iridoids and phenylethanol glycosides. The primary organs of support are the liver and kidneys through promotion of circulation health [22]. Preclinical research has shown that Rehmannia may be able to maintain quiescence and decrease senescence of hematopoietic stem cells, preventing age-related deteriorations as well [23].

Supplementation is utilized to aid in providing additional nutrients or functional foods to target support for specific body systems. The Canine Renal Support supplement contains a blend of ingredients designed to facilitate healthy functioning of the kidneys. The product serves as a foundation for addressing overall renal health and was used as such in this case. Catalyn, a multivitamin, and Renatrophin PMG, a bovine kidney extract, were used as additional nutritional support. Total supplementation provided vitamins, minerals, and important amino acids to aid in maintenance of nutritional adequacy and renal health.

Supplementation did not cure or treat renal failure in this case. However, when incorporated into a comprehensive plan, the supplements promoted overall organ and whole-body health, particularly benefiting renal health. Of course, the simple removal of the irritant (NSAID) led to a slow amelioration of renal/gastric damage symptoms but addressing the health of these body systems allowed for functioning to maintain health for years following renal burden.

CASE ANALYSIS

The patient had a history of high BUN first noted in December of 2019, so we cannot rule out that the NSAID may have exacerbated an underlying renal insufficiency. However, the direct cause of a high BUN in December of 2019 is not known. There are several conditions that can contribute to elevated BUN on a blood chemistry panel, such as, but not excluding, idiopathic renal insufficiency, specific renal insult, bleeding from gastric ulceration, dehydration, and to a smaller extent, high protein meat diet [24]. Given the timeline of events and how they correlate with the BUN values, it is likely that the dog may have had either early subclinical renal insufficiency or gastric ulcerations, or both previously. Combined with elevated creatinine and diagnostic imaging, renal insufficiency was suspected.

Increased BUN and creatinine values and related clinical signs after initiating NSAID use were improved through discontinuing NSAID use and short-term, aggressive fluid therapy. Healthy renal function and repair after suspected acute renal injury was supported through targeted diet and supplementation, allowing for normal antioxidant capacity and renal function. A commercially formulated renal diet was not considered for this patient as phosphorus levels were normal and the amount of protein intake could be managed.

It is noted that the creatinine level at visit 5 increased back to the same level post NSAID use. This recheck was 5 ½ months after the post-IV fluid therapy lab work was drawn. After giving aggressive IV fluid therapy for acute support to renal function and to lower kidney values, the kidney function will reacclimate over time to functioning without the benefit of the short-term fluid therapy. The patient was sent home with regular diet and increased water intake in the food, but no additional supplemental fluid therapy was given at home. It appears that although the patient's clinical presentation improved quickly, the kidney's healing process may have taken longer to be reflected in lab results. Morning-time urine specific gravity was not obtained when these blood samples were taken so the impact of the patient's daily hydration status on the renal values is



unknown.

As mentioned, an increase in BUN can be influenced by several factors. The final two annual bloodwork rechecks at one and four years after the initial NSAID use and subsequent treatments, reveal a creatinine that continues to lower into the normal range, and a BUN value that is also steadily decreasing to a significantly lower value than even the initial 'pre-NSAID use' bloodwork reflects. Compared to the baseline blood results at four months before the use of NSAIDs, the one and four year recheck renal values show improvement: the BUN is lower than the baseline value. Factors that may be contributing to the continued improvement in blood work values could be:

- Diet changed from commercially processed to complete home-cooked diet, reducing the amount of inflammation the patient may be exposed to through nutrition.
- Suspected improvement in gastric ulceration stabilizing the higher BUN values.
- The added renal specific nutritional support has helped the kidneys return to a more normal state of function.

Overall, this patient's clinical presentation, owner-reported quality of life, and recheck blood work all improved through ages 13 to 17.

PATIENT PERSPECTIVE

Regarding compliance, the patient owner noted that the regimen of administering supplements along with meals was easy to follow. No adverse events were observed when starting supplements and transitioning to a home-cooked diet.

The patient owner explains, "we have always valued the health of pets as they are family members to us, but this experience helped us realize even more so that diet and supplements can impact a dog's health just as much as us humans. Like with people, it's often just trying to treat symptoms when something goes wrong to help as it progresses. However, with the changes we made we saw actual improvements and a tangible difference in our pet's health. I'm so thankful to know that perhaps this case study of our dog may help other pets have a similar positive outcome."

CONCLUSION

This case report offers insight into the clinical application of preclinical research on nutritional factors of canine renal health. The findings of this case lend justification for further investigations of supplements such as Canine Renal Support, Renatrophin PMG, and Rehmannia for renal support in dogs. Case studies in nature offer an understanding of real-world application; however, due to the absence of a representative sample population and control group, it is often difficult to draw a conclusion on efficacy of a treatment option. Using the clinical successes noted in this report including normalization of BUN and creatinine levels as well as symptom resolution can aid in the development of more robust research on the topic. This case exemplifies the importance of nutritional quality and integrative veterinary care, including the utilization of functional foods to support renal function.

INFORMED CONSENT

Signed informed consent document in files

CONFLICTS OF INTEREST

An author, Samantha Koziol is a Standard Process employee that aided in the organization of medical records and previous literature to support this case report. This case was treated without the intervention of any Standard Process employee. Therefore, the authors declare no conflicts of interest.

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