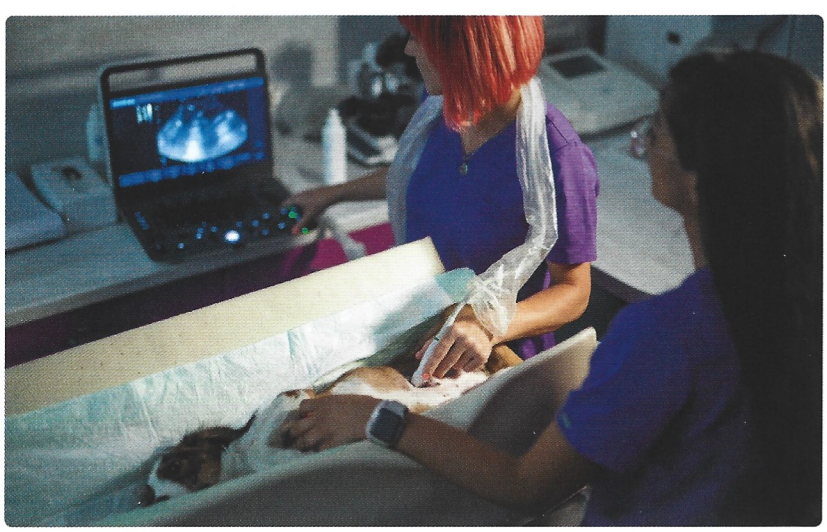
Juvenile Canine Renal Dysplasia

A look at a kidney issue affecting certain breeds.

BY DR J A SAMANTHA GOLDBERG BVSc MRCVS

Juvenile Renal Dysplasia, also known as Renal Malformation, is a condition where the kidneys do not develop correctly prior to birth. Whelps are born without completely normal function but it is not often noticed straight away since the dam will clean the puppies and supply plenty of fluid through milk. As the puppies get older differences may be seen between siblings, although some are not noticed until usually around six months. Age of onset of symptoms varies depending on how severe the malformation is and whether both kidneys are affected. Several dog breeds have been reported with this condition and some are considered genetic and some acquired, perhaps due to a toxic insult during development.

There appear to be some breeds where Juvenile Renal Dysfunction is more common, however since not all are biopsied it is not always easy to know which problem young animals with renal failure have; poor or incorrect development of the whole kidney, incorrect development of one part of the structure or toxic insult.



It is important to screen dogs for any potential issues.

Implicated breeds include Shih Tzu, Lhasa Apsos but also Alaskan Malamutes, Bedlington Terriers, Boxers, Chow Chows, Cocker Spaniels, Dobermanns, Keeshonds, Kooikerhondjes, Norwegian Elkhounds, Samoyeds, Shetland Sheepdogs, Soft Coated Wheaten Terriers and Standard Poodles. Some of these have been shown to have more of a microscopic malformation than hypoplasia, which refers to underdevelopment or incomplete development of a tissue organ.

Some conditions have been investigated and shown to be autosomal recessive, in other words you need two copies of the faulty gene, one from each parent, such as Familial Nephropathy (FN) a term used to describe kidney disease for which there is now a DNA test. This means the condition can be screened for and affected puppies avoided. Currently Cocker Spaniels are on the list of breeds where testing is recommended for FN.

There is a condition known as Cystic Renal Dysplasia, a condition in which the kidneys do not develop properly before birth which leads to formation of cysts and Hepatic Fibrosis, scarring of the liver, which is recognised in the Norwich Terrier after a related group was described with it. This is a breed with low numbers so screening for diseases is very important and it should be noted that eliminating carriers from the population is not a good thing as this limits the gene pool even further. Screening allows the breeder to retain carriers and only mate them to clear dogs.

In Shih Tzu there have been several studies but they have come to different conclusions which has clouded developing a screening test. One study of 74 random dogs showed 84% had some sort of dysplasia implying variable penetrance of any genetic disorder as they were affected to differing degrees. Another study in 1990 found a recessive pattern but another completed in 2003 found no obvious pattern which suggested autosomal dominance with incomplete penetrance. Basically, this means at the moment some are affected

by the defective genetics more than others which means it is not predictable. The probability is that the kidneys do not mature properly and the glomeruli stay immature. The glomeruli are microscopic bundles of blood vessels which are involved in filtration. Unwanted molecules are supposed to be selectively excreted from the blood stream into the tubules surrounding them and then into the collecting duct. When the glomerulus is faulty this is impaired.

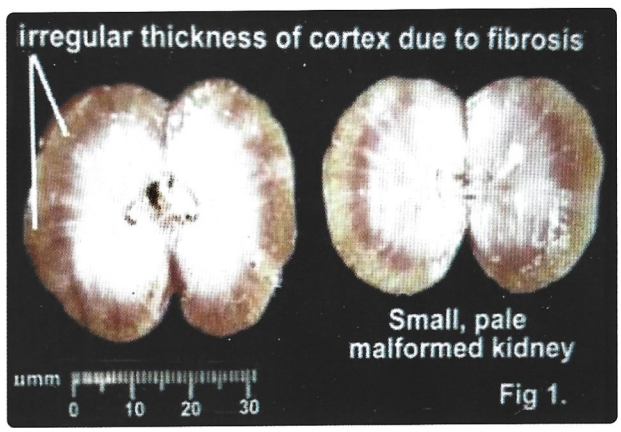
A study of a group of related Boxers implied recessive mode of inheritance and the breed is listed as having a higher number than some who go into renal failure when young. A hypoplastic form is thought to be involved as ultrasound scans shows smaller than expected kidneys.

It is possible that different breeds have different genetics involved especially since the structural and microscopic changes vary. This makes it hard at the moment to screen breeding populations and in breeds or related groups of dogs where there is thought to be a problem the best thing to do is annual blood tests and pre-breeding to check renal function. Ideally SDMA (see later in diagnosis) since this picks it up earlier.

There are many other renal conditions under investigation and in the future we will hopefully be able to screen for these and avoid breeding affected puppies.

Biopsies of kidneys from affected dogs is unlikely to help that patient but can give vital information for the breed if sent to researchers looking into the problem.





Above: One of the breeds implicated is the Shih Tzu. ***Ruth Dalrymple/The Royal Kennel Club©***

Left: Scan of a Shih Tzu with both kidneys affected. ***Courtesy of lhasa-apso.org/health/hrd.html***

Diagnosis

The kidneys may be small and not fully formed, a condition called hypoplasia. In a post-mortem they look pale in appearance compared to normal kidneys and are quite firm. The photo on the right is from a post-mortem of a Shih Tzu with both kidneys affected. This may affect one or both kidneys and can be seen on an ultrasound scan. If only one kidney is affected the other kidney may be able to work sufficiently for normal excretion to be carried out and the condition discovered coincidentally during a scan.

Alternatively, the kidneys may look normal from the outside but the internal structure of the kidneys doesn't form properly so does not filter waste from the blood correctly. In both situations the dog will be compromised.

If both kidneys are affected, at some point there will be changes noticed in the dog, poorer growth than siblings, poor appetite, polydipsia (excessive drinking) and polyuria (excessive urination) and later on vomiting and halitosis. These are symptoms of renal failure caused by the lack of correct filtration by the kidney tissue.

The renal parenchyma (structure) may be disorganised or incompletely formed and thus doesn't filter the blood flowing through it correctly. The kidneys usually filter out toxic by-products of metabolism and digestion, excreting them into urine and help the body retain fluid and useful blood components such as proteins and electrolytes. Urine will often be dilute as the kidney tissue is unable to concentrate urine and this leads to excessive thirst and an increased frequency and volume of urine. Puppies may be difficult to house train due to the increased volume which may flag to the owner something is not correct. Blood work will show a build-up of excretory products such as Blood Urea Nitrogen (BUN) and Creatinine as these are usually selectively excreted into urine. With time there is often also a problem with excretion of phosphorus and calcium which leads to more problems. Unfortunately, by the time BUN and Creatinine levels are elevated in blood samples at least 75% of normal renal function is lost making it harder to help the patient. A more useful



early screen is Symmetric Dimethylarginine (SDMA) which starts to elevate when 40% is lost.

Screening in young animals is not always straightforward as the kidneys may not be fully formed until 2-3 months old so biopsies are best reserved until later on. Blood sampling can give an indication of malfunction.

Prognosis

Life span is usually 1-2 years when symptoms are present in a puppy but since the amount of malformation is variable and whether one or two kidneys are affected so some dogs may be adult before symptoms are seen. Some may survive into middle age and to be fully diagnosed in the living dog needs ultrasound scanning as a minimum and for complete definition a biopsy. Blood testing will reveal abnormalities but not the cause. If the kidneys are really poorly developed the puppy may show signs at weeks old but if only one kidney is affected the dog may live almost a full life span with one good kidney.

Treatment and management

Hydration is very important as this will help in excretion of BUN and Creatinine. Even if the kidneys are poor at selectively excreting these the extra fluid going through and into urine will help reduce the levels in the blood. Encouraging drinking by adding things like meat broth to water, feeding a wet or soaked diet will help. The diet fed is also very important and, if your dog will eat them, renal specific diets can significantly increase the dog life span. Renal diets are restricted in protein – a medium level of easy to digest protein is used along with a restriction in phosphorus which can be toxic to the abnormal kidneys. With a picky eater it is possible to add phosphorus blockers to the normal diet as a compromise. Beware negating the effects of a prescription diet by adding treats. It is common to hear "he won't eat it so I add chicken" and this will add to the protein and not give the desired effect.

Using products such as Pronefra can be beneficial. This product helps by limiting availability of phosphorus and binding with uremic toxins. It promotes normal blood pressure which can be elevated in renal failure.

In later stages your veterinary surgeon may recommend the use of ACE inhibitors which promote blood flow through the kidneys aiming to help flush the toxins out into urine. Abnormal kidneys may be helped to function for longer maintaining a quality of life.

End stage renal failure results in weight loss – proteins are lost through the poor filtration and nausea from the build-up of toxic waste products. In humans this is where dialysis comes in, and although it is possible to dialyse our dogs the ethics are questionable as they cannot consent to be hooked up for hours several times a week.



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