

# Why Male Dogs Lift their Hind Limb for Micturition?

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## Abstract

The male domestic dogs lift their hind limb during micturition. This phenomenon is not seen in other domestic animals. The dogs urinate at the level of nostril so that other dogs can smell and identify the territory. The scenting of the area will convey the message to other eligible male dogs as well as the females during mating season. We are making an attempt to give a scientific reason for the above phenomenon. In the year 1979-1980, we have launched a program to study the comparative anatomy of the abdomen on various domestic animals with the help of whole-body CT scan. To study the anatomy of the male dog we have done a dissection of an autopsy specimen of a German shepherd and found the bony structure and the urethra are encased inside the glans penis. The bony structure called os penis or baculum is a cortical bone which was 17 cm in length. We brought two male country dogs which are siblings, dog A and B for further studies on the behavior of micturition. Dog A was castrated at the age of 3 months. We examined the physical growth and behavioral difference of dog A & B. We found dog B was aggressive in behavior and dog A docile. Dog B started lifting the hind limb for micturition at the age of 18 months; dog A continued to micturate by standing on four limbs. At the age of 20 months, we castrated dog B. After one week of castration dog B dropped its hind limb and started to urinate by standing on four limbs. We followed up regularly physical, hormonal assay status and imaging. A booster dose of testosterone 250 mg IM was administered to both dogs. Dog B responded to the booster dose and started lifting the hind limb for micturition; Dog A did not respond to the hormone challenge. To study this phenomenon of responder and non-responder to hormone we decided to estimate the androgen receptor protein. Since hormone can act only through their respective receptor proteins. On evaluation we found that dog B showed presence of receptor protein and dog A showed absence of receptor protein. The response to the androgen booster dose resulted in Dog B showing the turgescence of glans penis with increase in circumference which would have resulted in the resistance to the flow of urine in the urethra. To overcome this extra resistance the dog B has to exert additional pressure on the bladder by contracting the abdominal muscle by lifting the hind limb. On review of the literature search we have not found any similar study.

**Keywords:** Dogs, Micturition, Hind Limb, Os penis, Scent, Hormones, Turgescence

## Introduction

It is very common to see that domestic male canines lift their hind limb during micturition and we have not seen this habit in any other domestic animals. The lifting of the hind limb for micturition by the male dogs which will be at the level of the nostril of other dogs and will have a scenting effect is to inform the presence and as a caution for other

dogs to avoid their territory and possible confrontation [1]. It prefers to micturate on vertical surface like walls, trees, poles etc. This will prevent the scenting being washed away by rain or water. The scenting will last for 30-40 hours, the territory marking is the habit present with the canine which lift the hind limb whichever side of the body is closer to the wall or tree. During mating season, female dogs are attracted to the scented locality. The female dogs micturate in the sitting posture.

It was very fascinating to note why the dogs lift their hind limb at 90 degrees while urinating [2]. This curiosity became more during the early 1979-80's, which is when we studied the CT abdomen of various domestic animals' comparative anatomy of various other domestic animals to our surprise, we found a bone in the penis of the male dog. On reference and consultation with veterinary colleagues at Madras

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Veterinary College they confirmed that the male canines will have the bone called oспенis. This bone which is in the penis of the dog also called the baculum or penile bone, is absent in the human penis but present in other primates, such as the gorilla and chimpanzees [3].

The canines have got a restricted mating period in every calendar year which lasts for a week. The female comes into heat during that period and mating take place. The duration of the mating lasts for 30 minutes to one hour. The oспенis helps to sustain the erection for 30 minutes to 1hr. The heads of the male and female face against each other.



Figure 1: Dog mating Position

The mating is painful to the female hence once the glans penis penetrates the vagina, the sphincter vagina goes into spasm and it holds the corona of glans penis tightly, which prevents the withdrawal of glans penis from the vagina. During this period multiple ejaculations take place with a greater number of ova in the uterine cavity allowing maximum fertilization to sustain the species. The canine uterus is bicornuate with two fallopian tubes and a pair of ovaries. Uterine horns unite to form the body of the uterus and are joined at the vagina. The cervix is at the junction of the uterus and the vagina. The most caudal portion of the vagina has a dilated area called the vaginal vestibule [4].

## Methods

Our initial work was to ascertain the relationship of the oспенis and the urethra in the glans penis, hence the principal author procured an autopsy specimen of a German shepherd from the pathology department of Madras veterinary college and dissected to establish the relationship of the oспенis and the urethra in the glans penis. Both the urethra and the oспенis are encased inside the glans penis (Figure 1). It is confirmed that the oспенis is on the dorsal surface of the urethra. The penile bone was removed and evaluated further. The length of it was 17 cms and it was structurally a cortical bone with its own marrow and cortex (Figure 3 and Figure 4).

We decided to do further studies on the subject and we brought two male puppies which are siblings, named dog A and dog B. We have immunized both the dogs according to

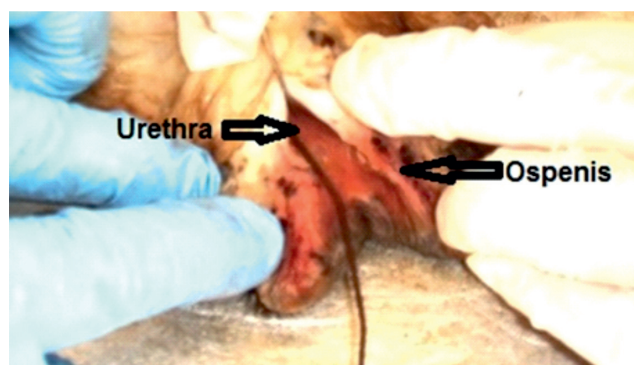


Figure 2: Urethra underlying bone



Figure 3: Oспенis



Figure 4 : Cross section of Oспенis establishing the cortical nature of the bone

the guidelines of Madras veterinary college. We observed the clinical growth parameters and laboratory parameters such as male and female hormones (Testosterone, estrogen and progesterone). The micturition habit of the two male puppies were studied for three and a half years. Both dog A and B had the micturition habit of standing on 4 limbs. Both were fed with a regular meat diet on alternate days.

We castrated Dog A at the age of three months. Both were monitored clinically on a daily basis and hormone assay and sonography of the penis (Figure 5) was done on a monthly basis. Radiography of the penis (Figure 6) was done annually.

It was observed that the physical development of dog A is greater than that of dog B. At the age of 18 months Dog B started lifting its hind limb for micturition (Figure 7a). By lifting the leg, the lie of oспенis changes from dorsum to

side by side. This may take away the direct pressure on the urethra. Dog A continued micturition by standing on four limbs (Figure 7b).



Figure 5 : USG of the penis

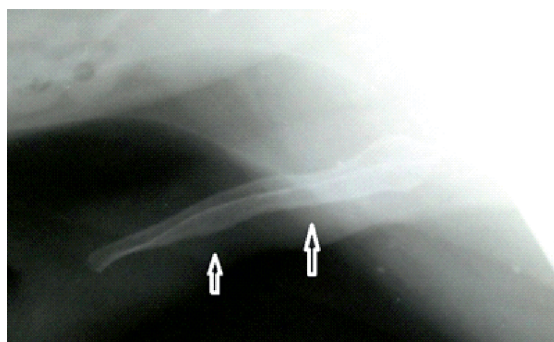


Figure 6 : Radiograph of penis

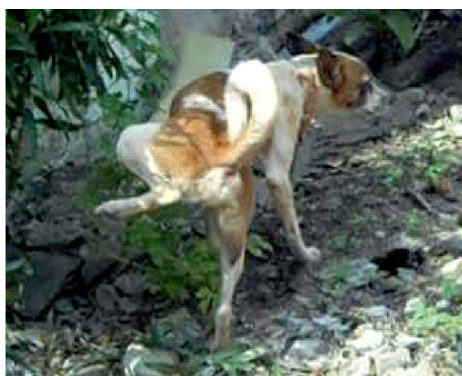


Figure 7a

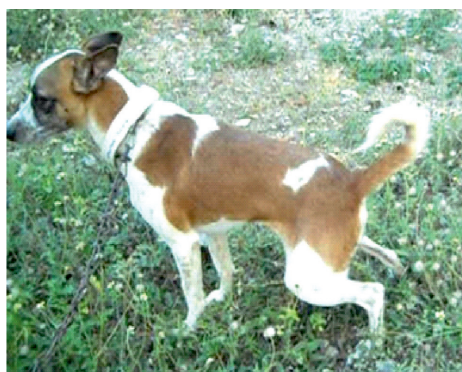


Figure 7b

On evaluation we found the androgen level was steadily increasing in dog B and the androgen level was static in Dog A, whereas the estrogen level was rising in dog A compared

to Dog B. Dog B was allowed to continue micturition by lifting its hind limb.

We estimated the androgen level in both dogs. The androgen level of Dog A was 10ug/dl and dog B showed the androgen value of 540ug/dl. We decided to castrate dog B at the age of 20 months. One week after castration dog B dropped its legs and started urinating on 4 limbs (Figure 8).

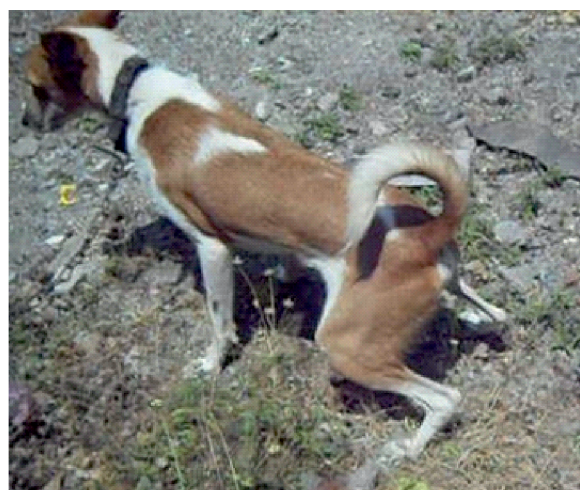


Figure 8: Dog B – Started micturition on 4 limbs

At that stage we found the androgen level was dropping in dog B. We decided to boost the androgen level and gave a booster dose of 250mg of testosterone IM to both dogs. The testosterone has a mean half-life of 8.5 days [5]. At that stage the androgen hormone level of dog B was 17.15 ug/dl and dog A was 12.2ug/dl. Further we decided to boost the androgen level and repeated the testosterone dose after a week, estimation showed an increase in the androgen level of dog B which was 195 ug/dl but dog A did not show any change. After the 4th dose, the dog B started lifting the hind limb again for micturition but dog A continued micturition by standing on 4 limbs. In spite of boosting the androgen level with testosterone in both dogs A and B, the dog B responded to the booster dose and started lifting the hind limb for micturition and Dog A did not show any response. The discrepancy of the behaviour between the dogs after the booster doses of testosterone drew our attention that there must be yet another factor and we tested for androgen receptor levels of both the dogs. All the hormones can act only through the receptor protein molecule. Androgen action involves pre-receptor, receptor and post-receptor mechanisms that are centered on the binding of testosterone to the androgen receptor [6]. On studying the androgen receptors, we found that dog B showed receptor positivity (Figure 9) and dog A was negative for receptor (Figure 10) hence dog A could not respond to the androgen booster dose.

Androgen response in dog B on boosting the level resulted in turgescence of the glans penis. We measured the glans

penis before and after androgen boosting. Dog B showed turgescence of the glans penis and Dog A didn't show any change. The turgescence of the glans penis would have resulted in increasing length and circumference of the glans penis. which have resulted in increase of the intraurethral pressure resistance to the free flow of urine. To overcome the resistance to flow extra pressure needed on the bladder. This is brought about by contraction of the abdominal muscle and lifting the leg.

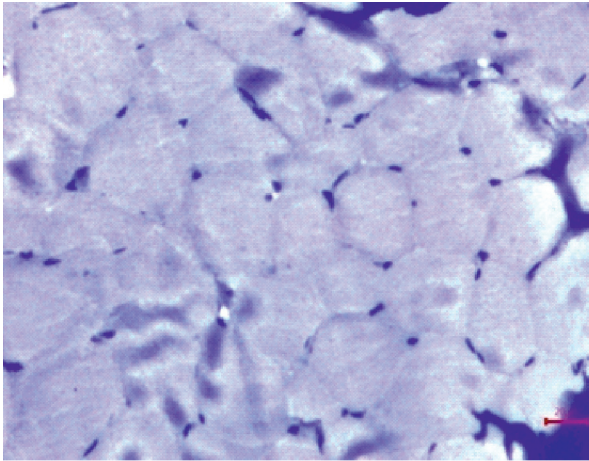


Figure 9: Androgen receptor positive

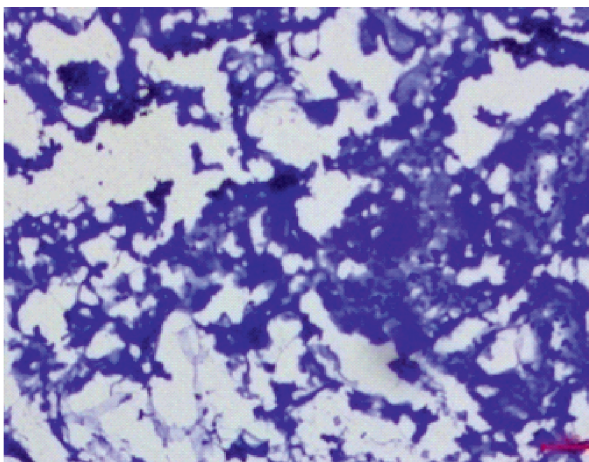


Figure 10: Androgen receptor negative

## Discussion

While studying the comparative anatomy of the abdomen of various domestic animals, to our surprise we found a bone in the penis of male dog. The literature references on this did not throw any light on the subject hence we continued our effort to find an answer for it and the principal author noticed on the CT scan image of os penis and tried to correlate the os penis exerting pressure on the urethra. Under the assumption of the anatomical position of os penis and urethra inside the glans may be causing direct pressure on the urethra, Urine flows by shifting the position of the os penis from dorsal to parallel (side by side). The androgen challenge showed turgescence in dog B

whereas it was not seen in dog A. The serial measurement circumferential of mid glans penis of Dog B showed an increase of 1.5 cm with the androgen booster injection which was not seen in the control dog A. The androgen challenge made dog B to raise its hind limb to increase secondary pressure on to the bladder whereas the turgescence was not seen in dog A. There was no rise in intraurethral pressure and urine flow was without any resistance hence dog A did not raise its hind limb for micturition. When hormone level came down the turgescence of glans penis disappears and intra urethral pressure decreased hence there was no need to exert excess pressure on the bladder by lifting the hind limb by contracting the abdominal muscle. The source of androgen are by the testes, ovaries and adrenal glands although they are primarily a male hormone, they are also found in females [7].

The aggressive behavioral changes noted in dog B was observed as increased frequency of barking and higher levels of activity on seeing visitors whereas dog A was docile. This concurred with the study conducted by Peter R. Borchert, on aggressive behavior of companion dogs, whereas castrated dogs were found that they were less likely to be aggressive [8]. In our study, we found that the timing of castration also played a role in modifying aggression, with early castration showing greater reduction in aggression.

Castration was most effective in altering objectionable urine marking, mounting, and roaming. With various types of aggressive behavior, including aggression toward human family members, castration may be effective in decreasing aggression in some dogs [9].

## Conclusion

The response to the androgen booster dose of Dog B has shown the turgescence of glans penis which would have resulted in increased resistance to the flow of urine. To overcome this extra resistance the dog has to exert more pressure on to the bladder, contracting the abdominal muscle and lifting the hind limb. The supplementation of recombinant receptor with challenging doses of testosterone might produce turgescence and the other changes in dog A. Further work is needed to confirm that replacing receptor proteins boosting androgen will bring back the turgescence and lifting of the hind limb. This may have application in human impotence also.

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