

Urodynamic findings in rabbit bladder

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Özet

Tavşanda ürodinami bulguları

Tavşan mesanesinin fizyolojik karakteristikleri değişik deneysel çalışmalarda ortaya konmuştur. Ancak bu çalışmaların çoğunda kontrol grubunda olan çok az sayıda denek mevcuttur. Bu çalışmanın amacı Yeni Zelanda türü beyaz tavşanların ürodinami sonuçlarını değerlendirmektir. Bu amaçla ortalama ağırlıkları 2250 (1250-3300 gr) arasında değişmekte olan 45 tavşanda; komplians, kapasite ve intravezikal basınç ölçümleri yapıldı. Elde ettiğimiz sonuçlar daha önce diğer çalışmalarda bildirilenler ile uyum göstermekte ise de çalışmamızda erkek ve dişi tavşanlar arasında kapasite ve komplians değerleri açısından anlamlı farklılık saptanmıştır. Dişi tavşanların mesanelerinin kapasite açısından daha büyük ve daha iyi kompliansa sahip oldukları gösterildi. Ancak her iki cins arasında bazal ve intravezikal basınçlar açısından farklılık yoktu.

Anahtar kelimeler: Mesane, tavşan, ürodinami

Summary

The physiological characteristics of rabbit bladder were described in different experimental rabbit models. But in most of these experiments the animals were used as control groups with very limited numbers. The aim of this study was to present urodynamic findings in 45 adult New Zealand white rabbits weighting between 1250-3300 g (mean 2250 g). Compliance, capacity and intravesical pressures were studied. Although the results correlates with previous studies, we encountered a difference in capacity and compliance and of male and female rabbit bladders, showing that the female bladders were larger in capacity and had a better compliance. But no significant difference were observed between the baseline and intravesical pressures.

Key words: Bladder, rabbits, urodynamics

Introduction

Rabbits were used in numerous experimental studies for investigations of bladder functions (1-7). Different equipment's were used in urodynamic investigations for various urodynamic evaluation. Although there is a similarity in urodynamic results, a difference between male and female rabbits was not mentioned in these previous studies. When using the rabbit as an experimental model, this difference may have adverse effects to the results, and must be well known by the investigator. In this study the urodynamic findings in normal rabbit bladder is studied and main difference from the literature findings is presented.

Materials and Methods

Animals: 45 adult (20 male and 25 female) New Zealand white rabbits were used for this study. All rab-

bits underwent urodynamic investigation. Urodynamic studies were performed in our laboratory for anorectal manometry and urodynamics. The urodynamic investigations were performed using Synectics PC Polygraph-HR (P-MAN 221 DOC/Sweden), IBM personal system 55 SX computer and polygram Software Urology Edition version 6.0B26 and 600 P4.

The rabbits received nothing by mouth 4 hours before the procedure because of the planned operation in their research protocols. All experimental protocols were approved by the animal welfare committee of the University of Istanbul Medical School before commencement of studies.

Anesthesia: Rabbits were sedated with an intramuscular injection of a kethamine/xylazine mixture (25 mg/ml kethamine, 6 mg/ml xylazine) at a dose of 0.7 ml per kilogram body weight.

Cystometrogram: With the animal secured in the supine position a double lumen balloon catheter (6F)

was inserted into the bladder through the urethra and the bladder were emptied. After this, the catheter is connected to the Mallinckrodt pressure transducer via a three-way stopcock. Urodynamic findings were recorded by Synectics PC Polygraph and evaluated in an IBM computer. After the catheterization, the bladder was instilled with normal saline, at room temperature, at a rate of 5 ml/min.

The intravesical pressure was continuously recorded. Typical volume-pressure profiles were obtained consisting of an initial rise in pressure followed by a plateau phase and ending with the increasing limb of pressure curve. The bladder capacity was defined as the volume at beginning of the rapidly increasing intravesical pressure (IVP) limb or the deflection point. The rate of change of volume per unit pressure (ml/cm H₂O) during the initial phase of the cystometrogram was used as a relative measure of compliance.

Methods of data analysis: Variance analysis was performed prior the statistical comparison, to show that the groups were not different in regard to their weight. Statistical analysis were done using Student-t test. A probability level less than 0.05 was required for statistical significance.

Results

The procedure was tolerated by all animals without any problems.

Cystometric studies: Bladder capacities, bladder capacity/weight ratio, baseline and intravesical pressure (IVP), and compliance values of male and female groups is presented in Figure 1,2.

Weight: The rabbits mean weight was 2250 gr (range: 1250 to 3300 gr). The mean weight in male group was 2255±327 gr and 2246±484 gr in female group. There was no difference between the weights of both groups (p>0.05).

Bladder capacity: In males mean bladder capacity was 23.4 ml (range:14-43 ml). In females mean bladder capacity was 32.64 ml (range: 15-80 ml). Mean bladder capacity/weight ratio was 10.43 ml/kg in males and 14.53 ml/kg in females. The difference

Figure 1. Urodynamic comparison of male and female rabbit bladder capacity.

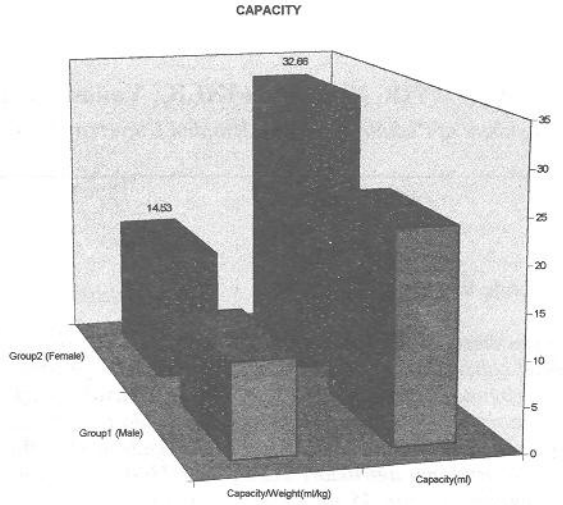
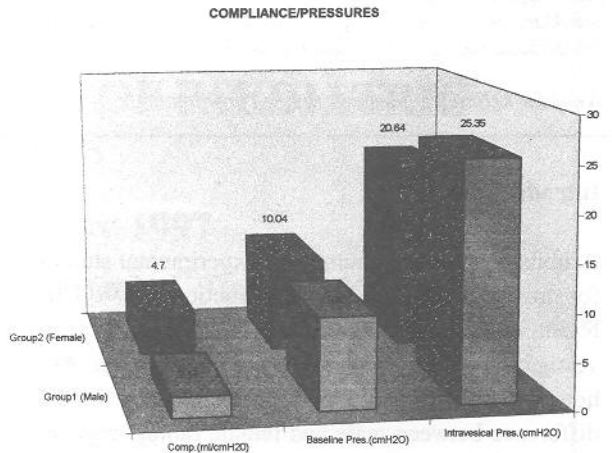


Figure 2. Urodynamic comparison of male and female rabbit bladder compliance and pressures.



between both groups was statistically significant (p<0.001).

Bladder compliance and pressures: Mean bladder compliance was 2.17 ml/cmH₂O (range:0.42-5.37 ml/cmH₂O) in males and 4.70 ml/cmH₂O (range: 0.77-16 ml/cmH₂O) in females (p=0.004). Mean baseline pressure in males was 9.65 cm/H₂O (range 4-18 cm H₂O). Mean baseline pressure in female group was 10.04 cm/H₂O (range:3-26). Mean IVP in males was 25.35 cm/H₂O (range: 10-48 cm/H₂O); mean IVP in female group was 20.64 cm/H₂O (range 9-46 cm/H₂O). There was no significant difference between baseline and intravesical pressures.

Table I. Statistical comparisons of both groups

	Group 1 (male)	Group 2 (female)	p value
Weight (g)	2255±327	2246±484	0.93
Capacity (ml)	23.45	32.66	0.006
Capacity/Weight ratio (ml/kg)	10.43	14.53	<0.001
Compliance (ml/cmH ₂ O)	2.17	4.70	0.004
Baseline pressure (cmH ₂ O)	9.65	10.04	0.809
Intravesical pressure (cmH ₂ O)	25.35	20.64	0.123

We could not find any correlation between the weight and capacity in both groups (in female group: $r=0.57$ and in male group: $r=0.43$). The statistical comparison of both groups is presented in Table I.

Discussion

Rabbit bladder is a good experimental model for comparing urological operations. The physiology of rabbit urinary bladder has been investigated in numerous studies (1-7). But still there is no significant data related with the normal urodynamic values of rabbit bladder. In addition to that, many of these series were small and the data reports are incomplete, allowing no firm conclusions in regards to their findings. The models of obstruction and augmentations were the main experimental studies done in rabbits. They usually tend to measure the capacity and compliance changes for comparison. But in most of the published studies, there were no discussion about the sex difference.

In our study we noticed that the female bladders were larger in capacity and had a better compliance although the weights of both groups didn't differ. We could not find any difference in bladder pressures and no correlation was observed between the weight and capacity in each group.

The urodynamic evaluation of normal rabbit bladder is quite complex. However, no study, to our knowledge, has had the opportunity to evaluate the rabbit urinary bladder from this standpoint. Although the anatomical variance of both sexes could be argued, we think further studies are required to explain this difference.

In conclusion, when using the rabbit as an experimental model, this difference may have adverse effects to the results, and must be well know by the investigator.

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