

## **Effect of the Extracts of Pumpkin Seeds on the Urodynamics of Rabbits: An Experimental Study**

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**Summary:** Pumpkin seeds were prepared into oil n-butyle alcohol and ether extracts. The effects of the three extracts on the urodynamics of rabbits were observed. It was concluded that the oil preparation could remarkably reduce the bladder pressure, increase the bladder compliance, reduce the urethral pressure. Other two kinds of preparations had no effect in this experimental. The mechanisms of the effect of oil preparation on the urodynamics and the prospect of clinical use was discussed.

**Key words:** pumpkin seed, urodynamics, rabbit

The functional abnormalities of bladder such as urgency and frequency of urination are common in early prostatic hypertrophy, prostatitis, cystitis and other disorders of bladder and prostate. It was reported that orally given powder or extract preparation of pumpkin seeds could alleviate above symptoms of the patients<sup>[5]</sup>. In order to find out the pharmacologic mechanism of the curative effect of pumpkin seeds on the functional disorder of bladder, we prepared pumpkin seeds into different extracts, and observed the effect of different extracts on the urodynamics of rabbits. Effective components were analyzed and the mechanism as well as clinical values were discussed.

### **MATERIALS AND METHODS**

#### **Preparation of pumpkin seed extracts**

The shells of pumpkin seeds, which were harvested from Yun Nan province, were removed. The shell-free seeds were grounded into fine powder. Then the powder was put into cold petroleum ether, immersed for 24 h, and then filtered three times. The oil layer and the filtered residual was separated. The residual was first put in 80 % warm alcohol and immersed for 6 h, then in 60 % warm alcohol for 6 h. The obtained alcohol extract was mixed with

petroleum ether again to remove oil. The water layer was then immersed in ether to get ether extract. The residual layer was again immersed by ethyl acetate three times to obtain lipid, which was then mixed with oil to form oil preparation. Finally, the residual was immersed with n-butyle alcohol to prepare n-butyle alcohol extract. In this way, oil preparation, ether extract and n-butyle alcohol extract were obtained (The whole process was completed with the aid of Pharmacologic Institute of Tongji Medical University).

#### **Urodynamical Measurement**

White male rabbits were fed with standard rabbit food for one week. Then the rabbits were anaesthetized by intravenous injection of luminal at the dose of 100 mg/kg body w. t. F8 urinary catheter was introduced through the urethral into bladder to make the bladder empty. The catheter was connected with fluid perfusion equipment and physiological recording instrument through a T tube. The bladder was continuously perfused with normal saline at the speed of 8-10 ml/min. At the same time, the pressure-volume curve was recorded by the physiologic recorder. After bladder micturition was shown on the curve, the pressure measurement of bladder was completed. Then the fluid perfusion velocity was

changed to 2 ml/min and the urinary catheter was slowly withdrawn from the urethral at the speed of 2 mm/min. When the lateral foramen of the catheter reached internal orifice of the urethral, the pressure started to increase and the physiological recorder started tracing the distribution graph of urethral pressure. The urethral pressure measurement was completed when the lateral foramen reached the external urethral orifice.

### Experimental Grouping

White male rabbits were randomly divided into three groups with each group having four rabbits. After the measurement of the pressure of bladder and urethra were completed, the rabbits of each group were injected oil preparation, ether and n-butyle alcohol extracts daily at the dose of 0.5 ml respectively (equivalent of about 45 g pumpkin seeds) for 7 days. The above process were completed again, the results were

compared with those before the administration of above preparations.

In order to observe the beginning point and maintenance time of the effect of the extracts, an additional rabbit was assigned to each group. The maximum bladder pressure was measured before and at 30 min, 60 min, 120 min and 180 min after injection of different extracts.

The results of above observations showed that the oil preparation had obvious effect on the pressure of bladder and urethra. We added 8 rabbits to this group and repeat the above experiment to verify the reproducibility of results.

## RESULTS

### The Effect of Each Type of Pumpkin Seed Extract on the Bladder Pressure (table 1)

Table 1. The effects of preparations on the bladder and urethral pressure (before and after the administration of extracts)

	Bladder pressure (kPa)	Capacity (ml)	Compliance (ml/kPa)	Urethral pressure (kPa)
Oil	2.90/2.33	56.25/70	54.0/65.8	2.34/1.65
<i>P</i>	<0.05	>0.05	>0.05	<0.05
n-butyle alcohol	2.30/2.16	57.5/62.5	67.3/64.8	2.06/1.77
<i>P</i>	>0.05	>0.05	>0.05	>0.05
Ether	1.80/1.63	61.5/66.25	73.1/78.3	1.68/1.48
<i>P</i>	>0.05	>0.05	>0.05	>0.05

Three types of extracts can decrease the bladder pressure. The maximum differences of bladder pressure between pre- and post-treatment of oil preparation, n-butyle alcohol and ether extracts was 4.3 mmHg ( $P < 0.05$ ), 1.05 mmHg ( $P > 0.05$ ) and 1.4 mmHg ( $P > 0.05$ ) respectively. The effects of three kinds of extracts on the bladder capacity, compliance were not significantly different.

### The Effect of extracts on the maximum urethral pressure (table 1)

The oil preparation, n-butyle alcohol and ether extract decreased the urethral

pressure by 36 %, 14 % and 12 % respectively. The differences of the pressure before and after treatment were 5.2 mmHg ( $P < 0.05$ ), 2.2 mmHg ( $P > 0.05$ ) and 1.5 mmHg ( $P > 0.05$ ) for three extracts respectively.

### The Effect of Three Extracts on Bladder Pressure (fig. 1)

After injection of extracts at the dose of 0.5 ml, it was found that only oil preparation could significantly decrease bladder pressure, and the effect started at 20 min and reached to its maximum within 2 h after injection of oil preparation, but other two

extracts had no significant effect on bladder pressure.

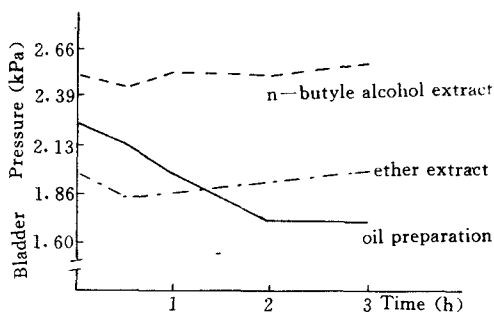


Fig 1. Effects of three preparations on the bladder pressure.

Table 2. The effects of oil preparation on the bladder and urethral pressure after increasing the number of rabbits

	Bladder pressure (kPa)	Capacity (ml)	Compliance (ml/kPa)	Urethral pressure (kPa)
Before adminis	2.47±1.45	50.6±9.3	53.2±12.8	2.38±0.41
After adminis	2.00±0.47	58.75±12.8	63.1±2.1	1.72±15.8
<i>P</i>	<0.01	>0.05	<0.05	<0.01

## DISCUSSION

Pumpkin is a kind of cucurbitaceous plant. The seeds of the plant have various pharmacological effects and has been used clinically for the treatment of intestinal parasitosis, primary hyperoxaluria, irritative bladder and prostatic hypertrophy<sup>[4]</sup>. Until now, the study about physiologic and pharmacologic effects of pumpkin seed is skimpy. We have observed the effects of pumpkin seed on the irritative symptoms of bladder in 1989 and found that the seeds have therapuetive effects. The long-term oral use of powder of pumpkin seeds could relax the urgency of urination and increase the bladder compliance<sup>[5]</sup>.

In this experiment three types of extracts from pumpkin seeds were prepared. The results showed that the three preparations could decrease the bladder and urethral pressure to different degree, but the oil preparation was most effective as compared with other two preparations. After

## Observation on Urodynamics After Increasing the Number of Rabbits in Oil Preparation Group (table 2)

After increasing the number of rabbits in oil preparation group, the decrease in maximum bladder pressure still could be observed. The decrease of bladder pressure was 7.6 mmHg averagely ( $P < 0.01$ ), bladder compliance was increased slightly ( $P < 0.05$ ), but there was no significant change in bladder capacity. The differences between maximum urethral pressures before and after treatment was 5.4 mmHg ( $P < 0.01$ ).

increasing the number of rabbits in the oil preparation group, the similar result was observed. It was found that the oil preparation not only decrease bladder pressure, but also increase the bladder compliance.

Our results, suggested that the active substance which affected the fountion of bladder and urethra might have higher content in the oil preparation. On the other hand, the other two preparations also caused some urodynamic changes, but the changes were not as obvious as that caused by oil preparation. The cause might be either the interfusion of effective substances owing to poor extract technology, or perhaps there were similar substances in the other two preparations, but their quantity and activity was lower.

The ingredients of oil preparation of pumpkin seeds preparation is too numerous to numerate. It was known recently that it mainly contains stearic acid, plmilic acid, linoleic acid, linolenic acid, myristic base and steroid. There are fourteen kinds of steroid substances in the oil of Chinese

pumpkin seeds<sup>[2]</sup>. The steroids have various biological activity. In the human body it mainly acts as hormones such as sex hormones and adrenocortical hormone etc.

There are a great number of different kinds of steroid hormone receptors in human cells, consequently, the physiological and pharmacological effects of the steroid material on the human body were extensive. For example, progestogen not only affects the uterine smooth muscles, but also causes relaxation of smooth muscles of urinary tract.

Based on our knowledge on the effects of the steroid hormones and our experiment results, we might speculate that the effect of pumpkin seeds oil preparation on lower urinary tract might be due to the direct or indirect effect of the different types of steroid substances found in the oil preparation. Our observation is preliminary, and active substances other than steroids in pumpkin seeds and their mechanism have yet to be studied.

This experiment have proved that

pumpkin seeds oil preparation can decrease the bladder pressure, increase the bladder compliance and decrease the urethral pressure. This effect of the oil preparation is the same as that of the antispasmodic drug on urinary tract<sup>[3]</sup>. From the above results, we concluded that the pumpkin seeds oil preparation may have a potential role in the treatment of the irritation of the bladder.

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grading system. The consistency of collagen morphological measurement with Child-Pugh grading system in reflecting liver function showed that collagen content in liver tissue can indirectly reflect liver function.

Use of image analysis system for morphological measurement of liver tissue collagen is a new method for quantitative evaluation of liver cirrhosis. Quantitative data of image are more accurate than simply use of common optical microscope for a morphological description. Moreover, the computer system of TJTY-300 possesses a high speed and

great capacity, and the image information can be saved and stored. This method may find wide application in the diagnosis and evaluation of treatment.

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