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LETTER TO THE EDITOR

Prostate Disease

Minimally invasive simple prostatectomy for a case of giant benign prostatic hyperplasia

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Dear Editor,

We would like to present a rare case of giant prostatic hyperplasia (GPH), which is defined as a prostate weight over 200 g for Easterners¹ or 500 g for Westerns.² Only 14 cases of GPH exceeding 500 g had been reported in the English literature by 2015 (Supplementary Table 1). To the best of our knowledge, this is the first report of removing a GPH exceeding 500 g by using minimally invasive laparoscopic technique.

A 52-year-old man was admitted to our hospital with long-standing symptoms of difficult defecation or elongation of defecation with dejecta turning small, which became worse during the past 3 months. However, he just had mild hesitant urination, without manifesting significant LUTS. The IPSS was 4. The routine laboratory investigations and the sex hormone levels were within the normal limits except total PSA (69.96 ng ml⁻¹). An imaging-urodynamic study showed that the volume of the bladder was 360 ml and the state of bladder outlet obstruction was mild, with a maximum flow rate of 18 ml s⁻¹ and no residual urine. CT scans showed that the prostate was abnormally enlarged, measuring 10.8 cm × 9.6 cm × 10.6 cm and almost occupying the whole pelvic cavity. The rectum was severely pressed posteriorly, and the bladder and seminal vesicles were displaced anteriorly (Figure 1a). Urography revealed passable filling of the bladder with a little higher position beyond the pubic symphysis. No urethral stenosis, ectasia, or atresia was found when voiding (Figure 1b). Two prostate biopsies were consistent with the diagnosis of BPH.

The “gold standard” for surgical treatment of BPH is transurethral resection of the prostate. Conventional open prostatectomy remains an effective and durable procedure for the treatment of symptomatic BPH with a large prostate volume (>80 ml).³ With the advent of minimally invasive simple prostatectomy (MISP) in recent years, the laparoscopic approach for the treatment of large prostatic adenoma was first proposed by Mariano *et al.*⁴ in 2002. Recently, a European-American multi-institutional analysis⁵ provided the largest outcome analysis reported for MISP for large BPH. Their results confirmed that simple prostatectomy could be safely and effectively performed in a minimally invasive fashion in a variety of healthcare settings where specific surgical expertise and technology are available. However, the median overall prostate volume was only 100 ml.

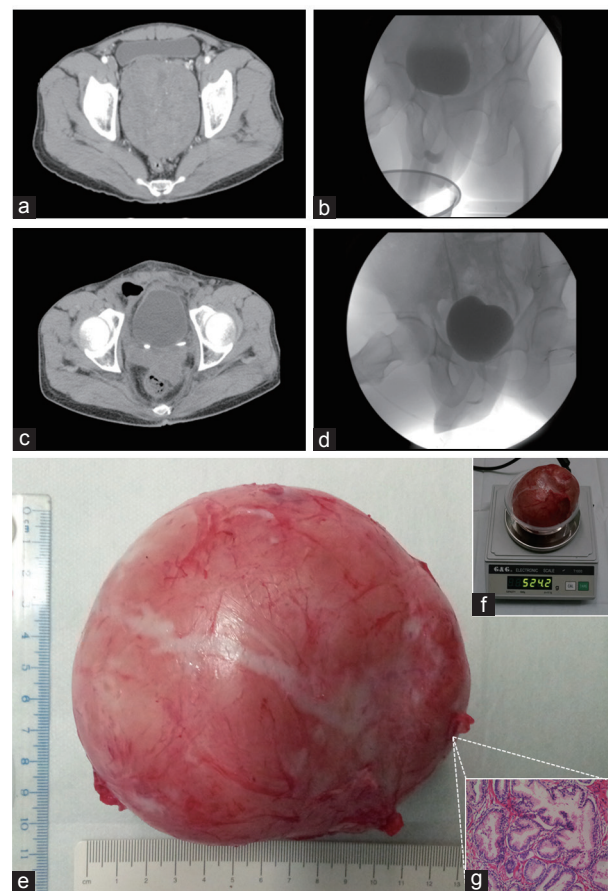


Figure 1: Imaging data and the removed prostatic specimen. Preoperative (a) and postoperative (c and d) imaging data. CT (a) show that the whole pelvic cavity is occupied by a giant prostate. Urography (b) reveals passable filling of the bladder with no urethral stenosis, ectasia, or atresia. CT (c) re-examinations show that the pelvic wound heals well and the bladder is in place. Cystoscopic urography (d) shows normal bladder containment with no urethral stenosis. (e) The final gross prostatectomy specimen measuring 11 cm × 13 cm. (f) The removed prostatic specimen weighing 524.2 g. (g) Histological observation shows a predominance of glandular hyperplasia with numerous dilated glands (H and E, ×200).

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How about MISP for GPH? In 2010, Singh *et al.*⁶ reported successful removal of the largest (384 g) case of cancer prostate by robotic

MISP in the literature. From this point of philosophy, we introduced laparoscopic simple prostatectomy as the premier technique for the treatment of the present case. Based on preparation with a detailed exploration of the imaging data, we finished most of the procedure by the laparoscopic operation (**Supplementary Figure 1**). However, due to the huge volume of the prostate, it was impossible to complete the dissection using the pure laparoscopic method even though the bladder wall was longitudinally cut apart. At the end of the operation steps, finger assistance of one hand was indispensable for reaching the apex of the prostate clinging to the urethra, and for dividing the distal residual pedicle of the Denonvilliers' fascia beyond the reach of the laparoscope.

Our preoperative imaging data showed that GPH in our case developed posteriorly and spherically (**Figure 1**), without typically repressing the urethra and leading to urethral obstruction. The main complaint of the patient was difficult bowel evacuation, which is different from most reported studies saying that LUTS (dysuria, straining, nocturia, hesitancy, and macrohematuria) were the main symptoms in such patients. Thus, only in this rare anatomically lucky accident where the large adenoma did not tightly wrap the posterior urethra could we remove the mass through the natural interval of the two in one piece with the urethral continuity well preserved.

The specimen in our case, weighing 524.2 g and measuring 11–13 cm in diameter, was an integral spherical piece with a relatively smooth capsule surface (**Figure 1e** and **1f**), which is also different from the lobulated or irregular shapes as reported in most other studies.^{2,6}

The total operation time, estimated blood loss, and hospital stay were 300 min, 800 cc, and 14 days, respectively. The patient received 200 ml blood transfusion during operation. No significant peri- or post-operative complication was observed. CT re-examination showed that the pelvic wound healed well, and the bladder was in place (**Figure 1c**). Cystoscopic urography showed normal bladder containment without urethral stenosis (**Figure 1d**). The catheter was removed after 4-week rehabilitation of the bladder function. Urodynamic re-test performed at 2-month follow-up showed satisfied voiding (**Figure 1d**), with a maximum flow rate of 16 ml s⁻¹ without residual urine. Cystoscopy showed that the bladder recovered well. The serum PSA value dropped to 0.3 ng ml⁻¹.

Histologic examination revealed a predominance of glandular hyperplasia with numerous dilated glands, from which secretion retention was commonly found. Part of the glandular epithelium was obviously columnar, and others were flat. In addition, there was also a small amount of stromal hyperplasia, part of which showed hyaline degeneration or necrosis, loose interstitial or edema, and foci of lymphocytic infiltrates (**Figure 1g**). Immunohistochemistry showed a typical BPH presentation (**Supplementary Figure 2**), with positive P63 and AE3 cells observed in the basal layers. Positive staining of AR was mainly observed in the luminal epithelium, while the negative staining of P504S and ER was observed throughout the sections. Strong PSA staining was universally seen in glandular cells. The proliferation index of Ki-67 staining was 2%–3%.

The presence of a testis, or more precisely androgens, and aging are two main factors that are generally considered essential for the development of BPH. It was found in our previous study⁷ that age and body mass index (BMI) were significantly correlated with the volume of the prostate in aged Chinese male populations. However, the patient in the present case was a 52-year-old middle-aged man with a BMI of 20.4. Similarly, Medina *et al.*⁸ reported a 57-year-old man with a BPH weighing 2410 g. These two cases seem to suggest that aging is not the main factor for the development of GPH.

Androgens, in particular dihydrotestosterone (DHT), are widely accepted as essential for the growth and development of the human prostate. In the present case, endocrine factors such as testosterone, estradiol, and prolactin were within the normal ranges. Unfortunately, we failed to detect serum free testosterone and DHT in the present case although they are known to help get more information about the alteration of androgen levels. The most typical characteristic of histologic examination in our case was predominant glandular hyperplasia with numerous dilated glands. Accordingly, AR protein was positively expressed in the glandular epithelium and almost negatively expressed in stromal cells. In addition, ER was totally negative. Many experimental studies have reported estradiol stimulation of prostate stromal cell proliferation *in vitro*,^{9,10} which seems to suggest that it was high AR expression in the glandular epithelium that led to universally predominant glandular hyperplasia in this case while stromal hyperplasia was not obviously found.

AUTHOR CONTRIBUTIONS

QSZ, YBZ, and BQW cared for the patient and collected clinical information, QSZ drafted the manuscript. WLH determined the operation scheme. All authors have read and approved the final manuscript.

COMPETING INTERESTS

The authors declare no competing interests.

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Supplementary Information is linked to the online version of the study on the *Asian Journal of Andrology* website.

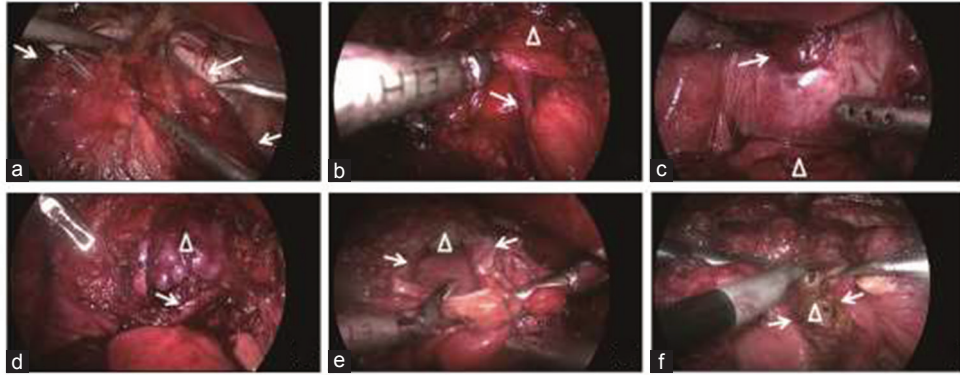
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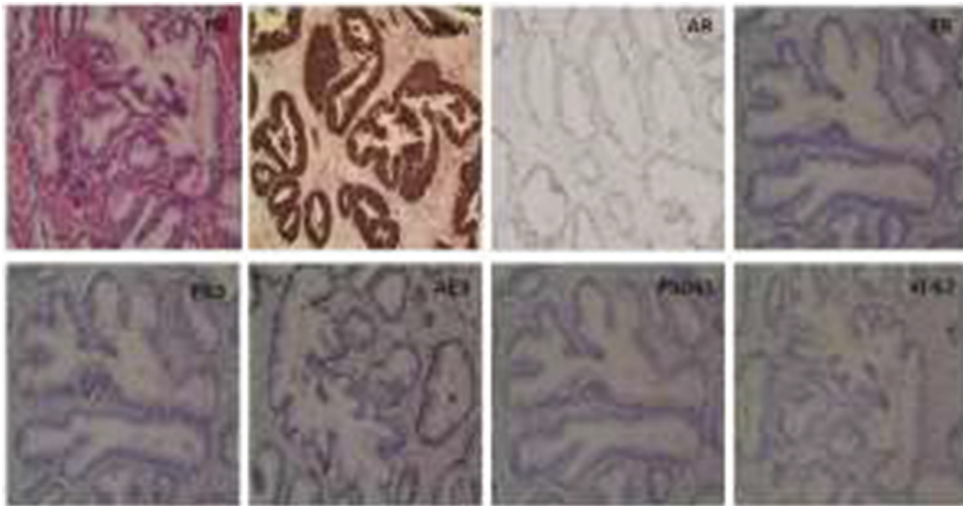
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Supplementary Figure 1: Panel figures showing a laparoscopic camera view of the “giant prostate.” (a) Three arrows show that the pelvis is almost completely occupied by the lateral limits of the prostate. (b) A single arrow shows the distal part of the right ureter, and the triangle denotes the position of the bladder. (c) A single arrow indicates the posterior dissection in progress on the recto-prostatic pouch, and the triangle denotes the position of the rectum. (d) A single arrow shows the left vasa deferentia, and the triangle depicts that the swollen seminal vesicles have been pushed to the right side of the massive prostate. (e) Two arrows show that the anterior wall of the bladder is incised longitudinally, and the triangle denotes the balloon of the urethral catheter. (f) Two arrows show the incised posterior wall of the bladder, and the triangle denotes exposure of the prostatic anterior capsule.



Supplementary Figure 2: Histological and immunohistochemistry observations of the specimen. Histological examination shows a predominance of glandular hyperplasia with numerous dilated glands (H and E, $\times 200$). IHC presents typical benign prostatic hyperplasia (IHC, $\times 200$).