การศึกษาเปรียบเทียบผลการรักษาภาวะต่อมลูกหมากโต ซึ่งมีขนาดต่อมลูกหมากไม่เกิน 50 กรัม โดยวิธีกรีดต่อมลูกหมากผ่านกล้องและวิธีตัดต่อมลูกหมากผ่านกล้อง โดยการทดลองทางคลินิกแบบสุ่มทดลอง

นายเกรียงศักดิ์ ประสพสันติ

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TRANSURETHRAL INCISION OF THE PROSTATE (TUIP) COMPARED TO TRANSURETHRAL RESECTION OF THE PROSTATE (TURP) IN TREATING BENIGN PROSTATIC HYPERPLASIA (BPH) PATIENTS WITH ESTIMATED PROSTATIC WEIGHT OF 50 GRAMS OR LESS : A RANDOMIZED CONTROLLED TRIAL

Mr. Kriangsak Prasopsanti

A Thesis Submitted in Partial Fulfillment of the Requirements
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เกรียงศักดิ์ ประสพสันติ : การศึกษาเปรียบเทียบผลการรักษาภาวะต่อมลูกหมากโต ซึ่งมีขนาดต่อมลูกหมากไม่เกิน 50 กรัม โดยวิธีกรีดต่อมลูกหมากผ่านกล้อง และวิธีตัดต่อมลูกหมากผ่านกล้อง โดยการทดลองทางคลินิกแบบสุ่มทดลอง (TRANSURETHRAL INCISION OF THE PROSTATE (TUIP) COMPARED TO TRANSURETHRAL RESECTION OF THE PROSTATE (TURP) IN TREATING BENIGN PROSTATIC HYPERPLASIA (BPH) PATIENTS WITH ESTIMATED PROSTATIC WEIGHT OF 50 GRAMS OR LESS : A RANDOMIZED CONTROLLED TRIAL) อาจารย์ที่ปรึกษา : รศ.นพ.สมภพ ลิ้มพงศานุรักษ์, อาจารย์ที่ปรึกษาร่วม : ผศ.สมรัตน์ เลิศมหาฤทธิ์ : 54 หน้า, ISBN 974-03-0993-3

วัตถุประสงค์ : เพื่อศึกษาเปรียบเทียบผลการรักษาต่อมลูกหมากโต ซึ่งมีขนาดต่อมลูกหมากไม่เกิน 50 กรัม โดยวิธีกรีดต่อมลูกหมากผ่านกล้อง (TUIP) และวิธีตัดต่อมลูกหมากผ่านกล้อง (TURP)

รูปแบบการวิจัย : การวิจัยเชิงทดลองที่มีการแบ่งกลุ่มโดยวิธีสุ่ม

สถานที่ทำวิจัย : โรงพยาบาลจุฬาลงกรณ์

ผู้ป่วย : ผู้ป่วยชาย อายุตั้งแต่ 50 ปีขึ้นไป ที่ได้รับการวินิจฉัยว่าเป็นต่อมลูกหมากโต จำนวน 67 ราย ถูกสุ่มให้ทำการรักษาด้วยวิธีกรีดต่อมลูกหมากผ่านกล้อง (TUIP) จำนวน 33 ราย และทำการรักษาด้วยวิธีตัดต่อมลูกหมากผ่านกล้อง (TURP) จำนวน 34 ราย

การรักษา : ผู้ป่วยทั้ง 2 กลุ่ม ได้รับการผ่าตัดโดยศัลยแพทย์ระบบทางเดินปัสสาวะคนเดียวกัน ทำการผ่าตัดผ่านกล้อง โดยผู้ป่วยได้รับการดมยาสลบหรือฉีดยาชาเข้าไขสันหลัง หลังผ่าตัดได้เก็บข้อมูล ความรุนแรงของอาการ (IPSS symptom score), ความแรงของการถ่ายปัสสาวะ (maximum urinary flow rate), ระยะเวลาทำผ่าตัด, ปริมาณ irrigation fluid ที่ใช้, ระยะเวลาใส่ foley catheter, ระยะเวลาอยู่โรงพยาบาลหลังผ่าตัด, ภาวะแทรกซ้อนและค่าใช้จ่ายที่ผู้ป่วยต้องจ่ายในช่วงเวลา 12 สัปดาห์หลังผ่าตัด

ผลการรักษา : มีผู้ป่วยที่สามารถติดตามผลการรักษาได้ครบถ้วนในช่วง 12 สัปดาห์หลังผ่าตัด จำนวน 59 ราย (กลุ่ม TUIP 30 ราย และกลุ่ม TURP 29 ราย) ในกลุ่มที่รักษาโดยการกรีดต่อมลูกหมากผ่านกล้อง (TUIP) พบว่าที่ 12 สัปดาห์หลังผ่าตัด IPSS symptom score ดีขึ้น 14.3 จุด เทียบกับกลุ่มที่รักษาโดยการตัดต่อมลูกหมากผ่านกล้อง (TURP) ดีขึ้น 15.5 จุด โดยไม่พบความแตกต่างกันอย่างมีนัยสำคัญทางสถิติ สำหรับ maximum flow rate พบว่าผู้ป่วยในกลุ่ม TUIP มี flow rate เพิ่มขึ้น 8.5 มล/วินาที เทียบกับเพิ่มขึ้น 13.2 มล/วินาที ในผู้ป่วยกลุ่ม TURP พบว่าผู้ป่วยกลุ่ม TURP มี flow rate เพิ่มขึ้นมากกว่าอย่างมีนัยสำคัญทางสถิติ ผู้ป่วยกลุ่ม TUIP มีระยะเวลาทำผ่าตัดและปริมาณ irrigation fluid ที่ใช้น้อยกว่าในผู้ป่วยกลุ่ม TURP อย่างมีนัยสำคัญทางสถิติ แต่มีระยะเวลาใส่สายสวนปัสสาวะ และระยะเวลาอยู่โรงพยาบาลหลังผ่าตัดใกล้เคียงกัน ภาวะแทรกซ้อนในทั้ง 2 กลุ่ม ไม่แตกต่างกันอย่างมีนัยสำคัญทางสถิติ ยกเว้นภาวะ retrograde ejaculation ที่พบในกลุ่ม TURP มากกว่าอย่างชัดเจน สำหรับค่าใช้จ่ายพบว่าไม่แตกต่างกัน ส่วนcost-effectiveness analysis พบว่า TURP ยังคงคุ้มทุนกว่า TUIP

สรุปการทดลอง : การรักษาภาวะต่อมลูกหมากโตด้วยการทำผ่าตัด TURP และ TUIP สามารถลดอาการของผู้ป่วยลงมาได้เท่าเทียมกัน แม้ว่า TURP จะเพิ่มความแรงของการขับถ่ายปัสสาวะ (maximum flow rate) ได้มากกว่า แต่ประเด็นสำคัญน่าจะเป็นอาการที่ดีขึ้นที่ผู้ป่วยรับรู้มากกว่า, TUIP ลดระยะเวลาการผ่าตัดและปริมาณ irrigation fluid ที่ใช้ลงมาได้อย่างชัดเจน โดยที่ภาวะแทรกซ้อนใกล้เคียงกัน ยกเว้นภาวะ retrograde ejaculation ที่ไม่พบในกลุ่ม TUIP แต่โดยรวมแล้ว TUIP ยังไม่สามารถลดค่าใช้จ่ายของผู้ป่วยลงได้ โดยสรุป TUIP ถือเป็นการผ่าตัดที่เป็นทางเลือกในการรักษาภาวะต่อมลูกหมากโต ที่ขนาดต่อมลูกหมากไม่เกิน 50 กรัมได้ แต่ไม่สามารถลดภาวะแทรกซ้อนและค่าใช้จ่ายลงจากการทำ TURP ได้

ภาควิชา..การพัฒนาสุขภาพ..... ลายมือชื่อนิสิต.....

สาขาวิชา...การพัฒนาสุขภาพ... ลายมือชื่ออาจารย์ที่ปรึกษา.....

ปีการศึกษา...2544.... ลายมือชื่ออาจารย์ที่ปรึกษาร่วม.....

4175376630 : MAJOR HEALTH DEVELOPMENT

KEY WORD : BPH/TUIP/TURP/IPSS SYMPTOM SCORE/RANDOMIZED CONTROLLED TRIAL

KRIANGSAK PRASOPSANTI : TRANSURETHRAL INCISION OF THE PROSTATE (TUIP) COMPARED TO TRANSURETHRAL RESECTION OF THE PROSTATE (TURP) IN TREATING BENIGN PROSTATIC HYPERPLASIA (BPH) PATIENTS WITH ESTIMATED PROSTATIC WEIGHT OF 50 GRAMS OR LESS : A RANDOMIZED CONTROLLED TRIAL. THESIS ADVISOR : ASSOC. PROF. SOMPOP LIMPONGSANURAK, M.D.,MPH., THESIS COADVISOR : ASST. PROF. SOMRAT LERTMAHARIT, B.Sc., M.Sc., M.Med.Stat., 54 pp.
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Objective : To evaluate the difference in effectiveness between TUIP and TURP in BPH patients with estimated prostatic weight of 50 grams or less and to compare safety outcomes, complication rate, cost (patient's perspective) and cost-effectiveness at 12 weeks postoperatively.

Design : A randomized controlled clinical study

Setting : King Chulalongkorn Memorial Hospital

Patients : 67 patients diagnosed of BPH with fulfillment of eligible criteria were enrolled in the study. The patients were randomly divided into TUIP group and TURP group. The TUIP group consisted of 33 patients and TURP group consisted of 34 patients.

Intervention : Both groups were operated according to their groups by one urologist under general or spinal anesthesia. The IPSS symptom score, maximum flow rate, operation time, volume of irrigation fluid used, days with catheter, postoperative hospital stay, complication rate, and cost (patient's perspective) were measured up to 12 weeks postoperative.

Results : Only 59 patients were completely follow-up for the clinical outcomes (39 patient in TUIP group and 29 patient in TURP group). The IPSS score was improved 14.3 points in TUIP group compared to 15.5 points in TURP group. There was no statistical significant difference. The improvement of maximum flow rate in TUIP group was 8.5 ml/sec compared to 13.2 ml/sec in TURP group. TURP was shown to cause more improvement in maximum flow rate than TUIP group. The operation time and the volume of irrigation fluid used in TUIP group were statistical significantly less than in TURP group. The periods of indwelling catheter and postoperative hospital stay were similar in both groups. The complication rates were also similar in both groups except retrograde ejaculation that TURP group has clearly more than TUIP group. The cost (patient's perspective) was quite the same but cost-effectiveness analysis was still in favor of TURP.

Conclusion : No difference in improvement of IPSS score between TURP and TUIP procedures. This subjective indicator is more important (especially to the patient) than objective indicator such as increase in urinary flow rate which shown to be more in TURP group. TUIP decrease the operation times and volume of irrigation fluid used significantly. However, the days with catheter, postoperative hospital stay, complication rate (except retrograde ejaculation) and cost were all similar in both groups. Cost-effectiveness analysis still favored TURP. In conclusion, TUIP may be used as an alternative to TURP in prostate size ≤ 50 group with the same effectiveness but it cannot reduced complication and costs as we expected earlier.

Department/Program……Health Development…….. . Student's signature……

Field of study……..…Health Development…… Advisor's signature…….

Academic year……..…..2001 ……..…… ……. Co-advisor's signature……....

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CONTENTS

Page

LIST OF TABLES

Tables **Pages**

LIST OF FIGURES

Figures **Pages**

CHAPTER 1

BACKGROUND AND RATIONALE

Benign prostatic hyperplasia (BPH) is a common condition of older male. The patients with lower urinary tract symptoms of frequency, hesitancy, weakening stream, urgency and nocturia accompanied with prostate enlargement are designated as BPH patients.

With the first report of a successfully performed open prostatectomy in the medical literature nearly 100 years ago[1] , the medical profession for the first time had a means of treating obstructive uropathy and preventing complications induced by benign enlargement of the prostate. In fact, it was the operation of prostatectomy that separated the urologist from the general surgeon, thus creating the specialty of urology.

Open prostatectomy was the solitary treatment of BPH until the advent of transurethral resection of the prostate (TURP) in the 1930's. Transurethral resection of the prostate was the first major endoscopic operative procedure in medicine. It steadily achieved dominance and until now accounted for more than 90 % of all surgery for BPH.

Transurethral resection of the prostate (TURP) is, of course, an effective therapy. The United States Agency for Health Care Policy and Research (AHCPR) published

guidelines for the evaluation and management of BPH in February 1994. These guidelines, based on a review of the urologic literature, reported that TURP has an 88% probability of symptom improvement (90% confidence interval, 75% - 96%). Furthermore, TURP achieved an 80% reduction from preoperative to postoperative symptom score- the greatest of any BPH therapy. So that it is considered the "gold standard" against which other treatment should be compared.[2]

With improved preoperative and postoperative medical care, the mortality rate associated with TURP has fallen to 0.2%. However, the morbidity has remained relatively constant at 18%[3] . Concerning about this morbidity, a number of less invasive therapeutic alternatives have emerged, including transurethral incision of the prostate(TUIP), balloon dilation, prostate stents, microwave hyperthermia, alpha adrenergic blocking agent, 5-alpha reductase inhibitor and observation.

Pathophysiologic components associated with lower urinary tract symptom in BPH patients include a static obstructive component, a dynamic obstructive component, a detrusor component, and a biopsychosocial component[4] . Ablation of prostatic tissue, which reduces the volume of the prostatic adenoma, thus reducing the static obstructive component, is the major approach to TURP and vaporization techniques such as laser treatments. Reducing the dynamic obstructive component is the primary emphasis of TUIP.

Transurethral incision of the prostate (TUIP) was first introduced by ***Orandi*** as an alternative to TURP for smaller prostate in the early 1970 's.[5] Since then this technique has been increasingly used to treat small but obstructive prostates. Many

reports revealed that the symptomatic relief and improvement in flow rate obtained following TUIP matching those of TURP. However, there were no agreement on **which prostatic size that should appropriate to TUIP**. The recommended prostatic weight varied from not exceed 30 g[10],[14],[15] to less than 60 g[4] or even unlimited weight[13],[16] (as much as 75-100 g).

There were also some confusions between the word “estimated total prostatic weight” and “estimated resected weight” which were mentioned in the literature because all of the previous studies [4],[5],[10],[13],[14],[15],[16] estimated the prostatic weight by digital rectal examination or cystoscopy **without real tissue resected**. These two methods of prostatic weight estimation were quite subjective and unreliable. The currently acceptable method to estimate the prostatic weight is by **transrectal ultrasonography (TRUS)**. Meta-analysis done by Roehrborn et al [6] showed that correlation coefficient between the real weight of surgically removal specimen and the estimated weight by TRUS was 0.89 compared to 0.46 and 0.58 for digital rectal examination and cystoscopy respectively.

If these uncertainties still remain, TUIP which is the safe and inexpensive procedure would continue to be underused procedure.

TUIP was shown in the previous studies to have shorter hospital stay, less operation time, less blood loss and fewer complications compared to TURP. This should have **potential to reduce health service cost**. Nevertheless, at present, there has been no such study to compare the economic implications of TUIP and TURP

using data obtained from a randomized controlled trial. Due to the constraint of the current health care system, the economic issue should be very important.

CHAPTER 2

LITERATURE REVIEW

Orandi first introduced TUIP as an alternative to TURP in men with small prostate glands in 1973.[5] He made the incision in the prostate and bladder neck at 5 and 7 o'clock, starting from the area of the ureteral orifice and continuing to the side of verumontanum. This incision was gradually deepened until the fibrous capsule of the prostate was seen. He reported this treatment in forty patients who had been followed for periods varying from 5 to 32 months, 34 patients were cured clinically, 5 were improved and 1 case was failure. He did not mention the size of prostate gland in numbers.

After that, several studies appeared in the literature testifying to the efficacy of this technique. Many articles reported the result with descriptive design (no comparison group), i.e. the studies of Delaere[7] , Christensen[8] , Hedlund [9] and Kelly[10] . Only Kelly stated the size of prostate gland. He performed TURP in 26 patients with an estimated gland size less than 30 grams. Hospital stay averaged 2 days and no patient required blood transfusion. With a mean follow-up of 16 months, there was the significant improvement in subjective symptom analysis and objective urodynamic parameters (peak and mean urinary flow, detrusor pressure at peak flow rate and postvoid residual urine volume). No patient experienced bladder neck contracture.

In a non-randomized prospective study[11] of 22 patients undergoing TURP and 22 patients undergoing TUIP, Edwards and Powell found no different in outcome with

respect to improvement in uroflow and voiding pressure decrease. Subsequently some articles compared TUIP to TURP in randomized controlled trials. In 1987, Orandi [12] reported a study in 132 consecutive men with the estimated prostate weight less than 40 grams by digital rectal palpation and cystoscopy. The patients were alternately assigned to TURP or TUIP (not blind allocation). Follow-up at 3 years (varied from 3 months to 3 years) showed that 88% of the TUIP patients reported a “good” result compared to 66% for the TURP group. No clearly definition of a “good” result was mentioned.

Nielsen[13] evaluated 49 consecutive patients aged 60 years or older with symptomatic BPH. Half of the patients had acute retention. The patients were randomly assigned to TUIP or TURP. The weight of the prostate gland was unlimited. The duration of the operation and volume of blood loss were significantly lower in the TUIP group. There were no differences in the duration of postoperative catheterization or hospitalization. The overall subjective success rate (patient satisfactory micturition) was 82 % for the TUIP group and 75% for the TURP group with 1 year follow-up. However, the result of the TUIP group included 3 patients who suffered postoperative retention after TUIP and underwent TURP after that. This should not be the right way for an intention-to-treat analysis.

Soonawalla et al[14] and Riehmann et al [15] performed the randomized controlled clinical trial compare TUIP and TURP in the treatment of BPH patients with estimated resectable prostate weight by preoperative cystoscopy combined with per-rectal examination of $\leq$ 30 g and $\leq$ 20 g respectively. They found that TURP and TUIP were generally equally effective in relieving bladder outlet obstruction secondary

to BPH. TUIP had significantly less complications, operating time, duration of hospitalization and reduced need for transfusion.

CHAPTER 3

RESEARCH QUESTIONS AND OBJECTIVES

3.1 RESEARCH QUESTIONS

Primary research question :

In BPH patients with estimated total prostatic weight of 50 gram or less by transrectal ultrasonography, does transurethral incision of the prostate (TUIP) result in at least a 25 % difference from transurethral resection of the prostate (TURP) in improvement of International Prostate Symptom Score (IPSS) from baseline?

Secondary research questions :

1. What are the differences in safety outcomes and complication rates between the two treatments at 3 months postoperatively ?
2. What is the difference in cost between the two treatments at 3 months postoperatively ?
3. What is the difference in cost-effectiveness between the two treatments at 3 months postoperatively.

3.2 RESEARCH OBJECTIVES

1. To evaluate the difference in effectiveness between TUIP and TURP in BPH patients with estimate prostatic weight $\leq$ 50 g (by TRUS).
2. To compare the safety outcomes, complication rate and cost (patient's perspective) between these two treatments at 12 weeks postoperatively.
3. To compare the cost-effectiveness between these two treatments.

3.3 HYPOTHESIS

Null Hypothesis	H0 :	Δ IPSS (TURP) - Δ IPSS (TUIP) = 0
Alternative Hypothesis	HA :	Δ IPSS (TURP) - Δ IPSS (TUIP) $\neq$ 0

(Δ IPSS = change of the IPSS symptom score from baseline at 12 weeks postoperatively)

3.4 KEY WORDS

BPH , TUIP , TURP , IPSS score , Randomized Controlled Trial

3.5 CONCEPTUAL FRAMEWORK

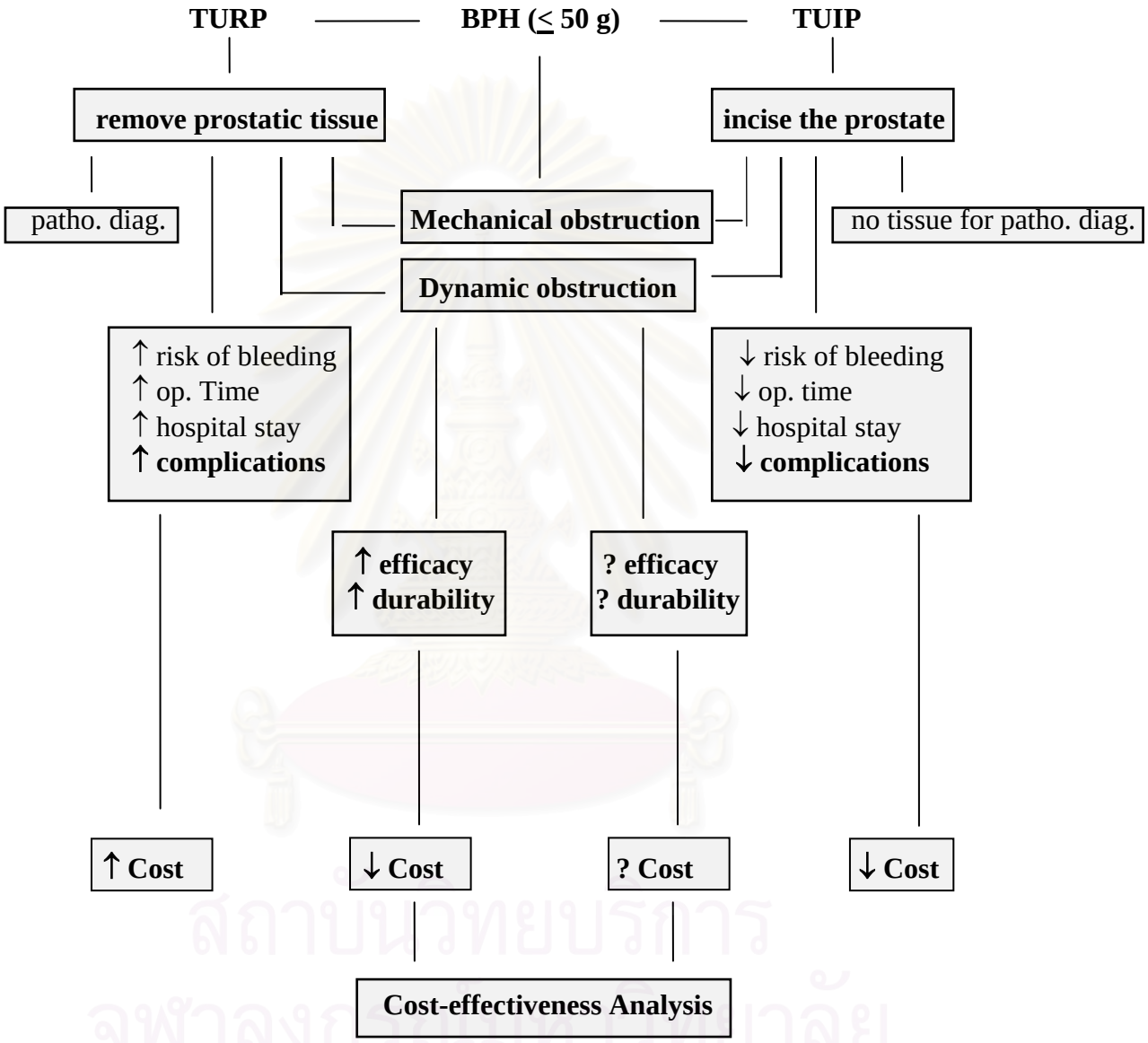

Figure 1 **Conceptual framework**

3.6 OPERATIONAL DEFINITION

1. International Prostate Symptom Score (IPSS)

This is the questionnaire comprises of seven questions that is operationalized for self-administration by the patient. Each question can be answered on a scale from 0 (symptom never present) to 5 (symptom always present) and the total score therefore varies from 0 to 35 points.

There is also one question to assess quality of life included in the IPSS. The answering scale varies from 0 (delighted) to 6 (terrible).

In this study, The IPSS score at baseline and at 4 and 12 weeks postoperatively would be reported (as means and 95% confidence intervals). The main outcome should be **a change from baseline at 12 weeks postoperatively.**

2. Maximum urinary flow rate

Uroflowmetry (measurement of urinary flow rate) is one of the simplest of urodynamic investigations. The patient would be asked to urinate into the machine under private circumstance.

The parameter obtained from uroflowmetry that is commonly used as a predictor of prostate obstruction is maximum or peak urinary flow rate.

In this study the uroflow would be recorded on *Dantec Urodyn 1000* machine. The maximum flow rate should be measured with a volume of > 150 ml at the time before operation and at 12 weeks postoperatively.

The results should be presented as means and 95% confidence intervals. The change from baseline at 12 weeks postoperatively in each treatment group should be compared.

3. Estimation of prostatic weight by TRUS

The prostatic volume(approximate to prostatic weight) would be measured by The Proscan Plus® multi-view transrectal probe using the two-plane cuboidal technique to compute volume.

The formula used in prostate volume calculation is

VOLUME = 0.7000 * D1 * D2 * D3

(The machine calculates the prostate volume automatically)

4. Transurethral resection of the prostate (TURP)

Via resectoscope, the prostatic tissue are resected piece by piece by electric loop until all of adenomatous tissue are removed and the surgical capsule is exposed. Careful hemostasis should be performed during resection .

5. Transurethral incision of the prostate (TUIP)

Via resectoscope, the electric incision is performed by a Colling's knife at the 5-o'clock and 7-o'clock position of the prostate, starting at the ureteral orifice and carrying it to the verumontanum . The incision depth should be to the point where fine filaments of the surgical capsule are seen (no tissue removed).

CHAPTER 4

RESEARCH METHODOLOGY

4.1 RESEARCH DESIGN

This study was a randomized controlled trial. The patients and the doctors who take care the patient postoperatively was blinded to the type of operation to reduce bias. The place of study was the urological unit , King Chulalongkorn Memorial hospital, Bangkok.

4.2 POPULATION AND SAMPLE

Target population : BPH patients with estimate prostatic weight $\leq$ 50 g

Sampled population : All BPH patients with estimate prostatic weight $\leq$ 50 g who were admitted for surgery in urological unit, King Chulalongkorn Memorial Hospital during study period.

Eligible criteria

Inclusion criteria

- symptomatic BPH patients , IPSS score > 7
- age over 50 years
- urinary flow rate consistent with outflow obstruction ($\leq$ 15 ml/sec)
- estimate total prostatic weight by transrectal ultrasonography (TRUS) $\leq$ 50 g

Exclusion criteria

- American society of anesthesiology (ASA) grade > 3
- inability to provide informed consent
- known history or suspicious of prostate cancer (from digital rectal examination, serum PSA and transrectal ultrasonography)
- renal impairment (serum creatinine > 2.0 mg/dl)
- patients on medications that would preclude them from study i.e. anticoagulant and finasteride

Sample size

Hence we wanted to compare the change of symptom score from baseline between two groups, the outcome was continuous variable, then the sample size was calculated by formula of mean difference in two independent groups.

$$n / group = \frac{2 (Z\alpha/2 + Z\beta)^2 \sigma^2}{(\mu1 - \mu2)^2}$$

$Z\alpha/2$ = 1.96 (type 1 error rate 5%, 2-tailed)

$Z\beta$ = 0.84 (type 2 error rate 20%)

$\mu1$ = expected mean of symptom score change in TURP group

= 11.8 [17]

$\mu2$ = expected mean of symptom score change in TUIP group

= 75% of TURP group

= 11.8×0.75

= 8.85

σ^2 = pooled variance

= 24.03 [17]

The calculated sample size was **43.3 subjects per group**. If the acceptable drop-out rate was 10%, then the sample size should be 43.3/ 0.9 = 48.1 or **49 patients per each group.**

Allocation technique

"Stratified randomization with **block size of four"** was used. When the BPH patients passed the eligible criteria, they should be divided into 2 subgroups or strata : **estimated prostatic weight ≤ 30 gram and estimated prostatic weight 30 - 50 gram.**

Within each stratum, the patients should be assigned to group A (TUIP) or group B (TURP) randomly. In the case of block size of 4, there were six possible combinations of group assignments: *AABB, ABAB, BAAB, BABA, BBAA* and *ABBA*. One of these arrangements was selected at random and the four subjects were assigned accordingly. This process was repeated until the required sample size was met.

For example :

Strata	**Prostate weight**	**Group Assignment**
1	≤ 30 grams	*ABBA BABA* .....
2	> 30 - 50 grams	*AABB BBAA* ....

4.3 INTERVENTION

1. Operative technique (maneuver)

- ***transrectal ultrasonography (TRUS***)

The TRUS was done by the investigator at the Out-Patient Department (OPD) before or after admission. Besides the prostatic volume, the silent prostate cancer could also be detected by this procedure and prostate biopsies should be performed as indicated.

- ***Transurethral resection of the prostate (TURP)*** and ***Transurethral incision of the prostate(TUIP)***

Both procedures were performed by **one urologists** i.e. the investigator. The procedures were done under regional or general anesthesia, as determined by the anesthesiologist, with the Storz 27 F resectoscope using distilled water as an irrigation fluid. A 22 F or 24 F Foley catheter was left indwelling postoperatively **without** traction or continuous irrigation until the urine appeared to be clear.

2. Compliance of intervention

Because these two interventions were surgical operations, so that compliance of intervention was not a question.

3. Co-intervention

Both groups should received the same interventions which could effect the outcomes. Parenteral antibiotics (i.e. Cetriaxone 1g IV was given in both group half an hour before operation and oral antibiotics (i.e. Norfloxacin 400 mg b.i.d.) was continued for 5 days postoperatively.

Any medications that could effect the BPH symptoms such as **alpha1-blocker or finasteride** were forbidden during 12 weeks period of follow-up.

4. Contamination

Intention- to -treat analysis was used in the study , thus the TUIP patients who needed additional TURP during study period should be counted as a failure of TUIP treatment.

4.4 OUTCOME MEASUREMENT

Primary outcome

1. **IPSS score** presented as **change from baseline** at 12 weeks postoperatively

Secondary outcomes

1. **Maximum urinary flow rate** presented as **change from baseline** at 12 weeks postoperatively

2. Safety outcomes

operation time

volume of irrigant fluid used

hemorrhage requiring transfusion

days with catheter

post-operative hospital stay

3. Complication rate

urinary tract infection

clot retention

urinary retention requiring re-catheterization

urinary incontinence

retrograde ejaculation

impotence

4. Cost (patients perspective)

Direct medical cost : hospitalization, laboratory tests, operation fee, drugs, cost at OPD, cost of complication treatment

Direct non-medical cost : transportation, family care, home aides

Indirect cost : absence from work, decrease earning ability

Intangible cost : pain

In this study we considered and compared only **direct medical cost** of the two procedures.

5. Cost-effectiveness Analysis

We used the quality of life / symptom improvement outcome cost coefficient (Q-SOCC) as an indicator for cost-effectiveness analysis as recommended by the international committee on economics for the 4th international consultation on BPH[18].

$$\text{Money spent per point of improvement} = \frac{\text{Total direct cost}}{\text{change in IPSS + change in QOL * 7 (weight factor)}}$$

4.5 DATA COLLECTION

Baseline data

Administrative variables : identification number, name, address

Zero state variables : age, weight, history of acute urinary retention, estimate prostatic weight, IPSS score, maximum urinary flow rate, hemoglobin, serum sodium, serum PSA, urine culture

Details of preoperative and postoperative investigations are shown in the **table1**.

Table1 **preoperative and postoperative investigations**

		Postoperative		
	Preoperative	**24 hours**	**4 weeks**	**12 weeks**
CBC, U&E	+	+	-	+
UA & C/S	+	-	+	+
IPSS score	+	-	-	+
Flow rate	+	-	-	+
TRUS	+	-	-	-
PSA	+	-	-	-

[CBC : complete blood count

U&E : blood urea nitrogen, creatinine and electrolyte

UA & C/S : urinalysis and urine culture

IPSS score : International prostate symptom score

Flow rate : maximum urinary flow rate ; TRUS : transrectal ultrasonography

PSA : serum prostate specific antigen ; + = measured ; - = not measured]

6.1 DATA ANALYSIS

Drop-outs and loss to follow-up

should be no more than 10%. The reasons for postoperative withdrawal by treatment group should be identified.

Type of analysis

An **intention- to-treat analysis** was used in evaluating the efficacy variables.

Aspects of analysis

Efficacy / Effectiveness

Adverse effects

Economic analysis

Appropriate statistical tests

1. The **baseline characteristics** of men in each of the treatment arm should be compared and presented as **mean and standard deviation (S.D.)**

Baseline Characteristics	**TURP**	**TUIP**
No. Randomized		
No. Completing study		
Age (y)	report **Means , S.D.**	
Estimated prostate weight(g)		
Serum sodium (mEq/l)		
Hemoglobin (g/l)		
IPSS		
Maximum flow rate (ml/sec)		

2. The efficacy profiles at baseline and 12 weeks follow-up points and **change from baseline at end of the study** (12 weeks) should be presented as **Means and 95% CI** .

	Pre-op.	**12 weeks** *postoperatively*	**Change**
IPSS			
TURP			
TUIP			
Max. Flow rate	———	**Means (95% CI)**	———
TURP			
TUIP			

- **The difference** between the **change from baseline** of the TURP group and TUIP group was reported accompanied with **the 95% confidence intervals**
- **Independent student's t-test** was used to compare the change at 12 weeks from baseline of the two groups.
- If the assumption of normal distribution was not met, the non-parametric method, i.e. **Mann-Whitney U test** should be used instead.

3. The safety outcomes and **major complications** should be reported for each treatment group.

- **Independent student's t-test** should be used in analysis of continuous data (e.g. operation time, volume of irrigation fluid used, days with catheter, post-op hospital stay and time to normal activity).
- If the assumption of normal distribution was not met, the non-parametric method, i.e. **Mann-Whitney U test** should be used instead.
- **Fisher's exact test** should be used in analysis of categorical data (e.g. hemorrhage requiring transfusion, complication rate).

4. All ***P-values*** (two-tailed probability***) < 0.05*** were considered statistically significance.

4.7 ETHICAL CONSIDERATIONS

1. TURP and TUIP are generally acceptable methods of treating BPH patients with slight to moderate enlargement of prostate gland (estimate prostatic weight $\leq$ 50 g)
2. The investigators (all staff in urological unit) are very familiar with these two procedures.
3. Informed consent from every patient.
4. The study should be sent for approval by the hospital ethical committee.

4.8 LIMITATIONS

1. ***Number of BPH patients who need the operations***

During the last three years (1996-1998), there were around 150 to 250 patients who received either TURP or TUIP in King Chulalongkorn Memorial hospital per year. If the patients who have estimated prostatic weight $\leq$ 50 g are three-quarters of these numbers combined with the follow-up time of 3 months, this study may not finish in one year.

2. ***'Blinding' of the study***

In clinical research about operative procedures , to make a so-call "double-blind" study is very difficult if not impossible. We tried to reduce bias by letting the doctors who took care the patients postoperatively and ,also, the patients 'blind' to the type of operations. However we were not sure these should be completely 'blind' or not.

4.9 BENEFITS OF THE STUDY

BPH is the common urological disease affecting old aged man (more than 50 years). This study will provide evidences that whether TUIP , which is easier in surgical technique and less operative time compare to TURP, can be safely and effectively used in stead of TURP in BPH patients with estimated prostatic weight not more than 50 gram.

If TUIP is proved to be effective, it should be used as primary treatment in most of the cases of BPH who need surgical operation because we expect that more than three-quaters of BPH patients have the prostate weight of 50 gram or less. This should save time for the surgeons and (probably) save cost for the hospital and also the patients.

CHAPTER 5

RESULTS

5.1 CHARACTERISTICS OF THE STUDY POPULATION

A total of **67 BPH patients** with estimated prostatic weight ≤ 50 grams who are admitted for surgery in urological unit, King Chulalongkorn Memorial Hospital. During June 1999 and July 2002, and met the eligible criteria were recruited to the study.

The patients were blindly random allocated into two groups, **TUIP group** and **TURP group**, by stratified randomization with block size of four. The TUIP group consisted of **33 BPH patients** who underwent transurethral incision of the prostate and the TURP group consisted of **34 BPH patients** who underwent transurethral resection of the prostate (TURP). All operations were performed by one urologist (KP).

Table 2 **Baseline characteristics of the study population**

	TURP	TUIP
No. randomized	34	33
No. completing the study	29	30
Age (year)		
Mean, S.D.	65.17, 8.09	67.73, 8.81
(Min-Max)	(51-84)	(50-87)
Body weight (kilogram)		
Mean, S.D.	61.92, 11.04	62.16, 10.59
(Min-Max)	(40-83)	(35-82)
Presented with urinary retention	13	10
No. of patients (%)	(44.8%)	(33.3%)
Preoperative UTI	7	4
No. of patients (%)	(24.1%)	(13.3%)
Estimated prostatic weight (gram)		
Mean, S.D.	30.95, 10.63	30.02, 9.46
(Min-Max)	(15.0-50.0)	(12.4-49.9)
Hemeglobin (g/d1)		
Mean, S.D.	13.48, 1.66	13.59, 1.53
(Min-Max)	(8.9-16.3)	(10.3-16.7)
Serum sodium (mEq/L)		
Mean, S.D.	139.03, 2.40	139.43, 2.74
(Min-Max)	(134-146)	(135-146)
Serum creatinine (mg/dl)		
Mean, S.D.	1.22, 0.34	1.17, 0.32
(Min-Max)	(0.8-2.0)	(0.8-2.0)

Table 2 **(continued)**

	TURP	TUIP
Serum PSA (normal: 0-4 mg/dl)		
Mean, S.D.	2.78, 1.99	3.21, 3.05
(Min-Max)	(0.4-9.2)	(0.3-15)
IPSS score		
Mean, S.D.	24.03, 4.48	23.00, 4.80
(Min-Max)	(15-35)	(14-35)
Quality of life score		
Mean, S.D.	5.14, 0.74	4.77, 0.97
(Min-Max)	(4-6)	(3-6)
Maximum flow rate (ml/sec)		
Mean, S.D.	5.67, 5.09	5.32, 4.62
(Min-Max)	(0-14.5)	(0-13.9)

Eight patients (11.9%) who were enrolled in this study cannot be completely follow-up for the clinical outcomes, so the results from only **59 patients**, **29 in TURP group** and **30 in TUIP group**, were used for the study. The baseline characteristics of the 8 patients not completing the study were listed in **Table 3**

As shown in **table 2**, the patients in both groups were comparable in baseline characteristics such as age, body weight, estimated prostatic weight, blood hemoglobin, serum sodium, serum creatinine, serum PSA level, IPSS score, quality of life score and maximum urinary flow rate. Number of patients presented with acute urinary retention and preoperative urinary tract infection was somewhat higher in TURP group than TUIP group. (13 patients versus 10 patients and 7 patients versus 4 patients, respectively).

Table 3 **Baseline characteristics of the patients NOT completing the study by treatment group**

present as Mean, S.D.

	TURP (n=5)	**TUIP** (n=3)
Age (year)	71.60, 10.41	69.33, 4.04
Body weight (kilogram)	60.50, 17.17	59.83, 5.01
Present with urinary retention	3	1
No. of patients (%)	(60.0%)	(33.3%)
Preoperative UTI	2	0
No. of patients (%)	(40.0%)	(0%)
Estimated prostatic weight (gram)	31.30, 14.87	20.9, 9.75
Hemoglobin (g/1)	12.78, 1.63	13.30, 2.52
Serum sodium (mEq/L)	142.60, 2.19	139.00, 4.58
Serum creatinine (mg/dl)	1.16, 0.23	1.10, 0.17
Serum PSA (normal: 0-4 mg/dl)	3.68, 2.55	3.90, 3.06
IPSS Symptom score	20.40, 5.94	23.67, 1.53
Quality of life score	5.20, 0.45	4.67, 0.58
Maximum flow rate (ml/sec)	3.68, 5.29	7.07, 6.17

5.2 CLINICAL OUTCOMES

5.2.1 The efficacy outcomes

The primary outcome of this study was **the change of IPSS score from baseline at 12 week postoperatively**. The IPSS symptom score was improved **14.3** points

(95% confidence interval : 11.8-16.8) in TUIP group compared to improvement of **15.5** points (95% CI : 12.8-18.1) in TURP group.(**Table 4**) There was no statistical significant difference between the change of symptom score in these two groups using **Mann-Whitney U test** . (**Table 5**)

Table4 The change of IPSS score and maximum urinary flow rate

present as Mean and [95% CI]

	Pre-op.	**12 weeks** *postoperatively*	**Change**
IPSS			
TURP	24.0	8.5	15.5
	[22.4-25.7]	[6.4-10.7]	[12.8-18.1]
TUIP	23.0	8.7	14.3
	[21.3-24.7]	[6.8-10.6]	[11.8-16.8]
Max. Flow rate			
TURP	5.7	18.9	13.2
	[3.8-7.5]	[16.5-21.3]	[10.4-16.1]
TUIP	5.3	13.8	8.5
	[3.7-7.0]	[11.6-16.1]	[6.6-10.5]

Table 5 **The change of IPSS score and maximum urinary flow rate : Statistical significance**

Present as Mean, [95% CI]

	TURP (n=29)	**TUIP** (n=30)	**P value***
Change of IPSS	15.5	14.3	p = 0.391
	[12.8-18.1]	[11.8-16.8]	[NS]
Change of maximum	13.2	8.5	p = 0.022
Flow rate	[10.4-16.1]	[6.6-10.5]	[Sig.]

* Mann-Whitney U test

The other efficacy outcome was the change of maximum urinary flow rate from baseline at 12 weeks postoperatively. The improvement of maximum flow rate in TUIP group was **8.5 ml/sec** (95% CI : 6.6-10.5 ml/sec) compared to **13.2 ml/sec** (95% CI : 10.4-16.1 ml/sec) in TUR-P group. (**Table 4**)

TURP was shown to cause more improvement in urinary flow rate than TUIP by statistical test (**Table 5)**

5.2.2 The safety outcomes

The safety outcomes included operation time, volume of irrigation fluid used, hemorrhage requiring transfusion, days with catheter and post-operative hospital stay. The results were shown in **table 6**.

Table 6 **The safety outcomes**

present as Mean and [95% CI]

	TURP (n=29)	**TUIP** (n=30)	**P value***
Operative time (min)	34.21 [28.85-39.56]	13.43 [11.56-15.31]	p < 0.001
Volume of irrigation fluid used (ml)	12,848.90 [9,910.32-15,787.48]	3,767.50 [3,087.88-4,527.12]	p < 0.001
Hemorrhage requiring transfusion (No. of patients)	0	0	
Days with catheter (days)	2.79 [2.41-3.17]	2.60 [2.31-2.89]	p = 0.806
Post-op hospital stay (days)	4.03 [3.61-4.46]	4.07 [3.63-4.51]	p = 0.757

***** Mann-Whitney U test

From **table 6**, the operative time and the volume of irrigation fluid used in the TUIP group were averagely 13.43 minutes and 3,767.50 millilitres respectively. These were obviously less than in the TURP group, which were 34.21 minutes and 12,848.9 millilitres, and were proven of statistical significant difference by Mann-Whitney U test ($p<0.001$).

None of the cases in both groups required blood transfusion. The periods of indwelling catheter postoperatively and postoperative hospital stay were similar in both groups (2.97 days versus 2.60 days and 4.03 days versus 4.07 days respectively). The statistical test showed no significant difference ($p > 0.05$).

5.2.3 Complication rate

Postoperative complications of both procedures were detected at 3 periods which were 1) intraoperative and immediate postoperative period (during that admission) 2) at 4-week postoperative and 3) at 12-week postoperative. There was no case of TURP Syndrome (symptoms caused by dilutional hyponatremia from absorption of irrigation fluid) and no case of mortality in this study. The complications could be divided into early and late complications. Early complications comprised of urinary tract infection, clot retention and urinary retention requiring re-catheterization. Late complications included urinary incontinence, retrograde ejaculation and impotence.

The results were shown in **table 7**

Table 7 **Complication rate**

Present as No. of patients (%)

	TURP (n=29)	**TUIP** (n=30)	**P value***
Urinary tract infection	7 (24.1%)	3 (10.0%)	p = 0.181
Clot retention	1 (3.4%)	6 (20.0%)	p = 0.103
Urinary retention requiring re-catheterization	1 (3.4%)	4 (13.3%)	p = 0.353
Urinary incontinence	2 (6.9%)	1 (3.3%)	p = 0.612
Retrograde ejaculation	9 (31.0%)	0	p < 0.001
Impotence	2 (6.9%)	0	p = 0.237

* Fisher's exact test

For early complications, the patients in TUIP group seemed to have more incidence of postoperative clot retention (20.0% versus 3.4%) and urinary retention requiring re-catheterization (13.35% versus 3.4%) but had less UTI (10.0% versus 24.1%). For the latter finding, this may be partly explained by less preoperative UTI in the TUIP group. However, these differences were not statistically significant.

By contrary, TURP group had more late complications than TUIP group namely urinary incontinence, which all are urge incontinence (6.9% versus 3.3%), retrograde ejaculation (31% versus 0%) and impotence (6.9% versus 0%). Only retrograde ejaculation was shown to have statistically significant difference.

5.2.4 Cost

In this study, we considered and compared only direct medical cost, in patient's perspective, of the two procedures. The direct medical cost included the cost of hospitalization, laboratory test, operation charge (include anesthesia), material used (irrigation fluid and drugs), treatment of complications and cost at OPD (see details in Appendix III). The results were shown in **table 8** and **table 9**.

Table 8 **The direct medical cost in patient's perspective** present as means(Baht)

	TURP	**TUIP**
Hospitalization	2,824.14	2,846.67
Laboratory tests	2,060.00	2,060.00
Operation charges	6,000.00	6,033.33
Materials	771.79	357.02
Treatment of complications		
Early complications	17.24	123.33
Late complications	155.17	40.00
Cost at OPD	320.00	320.00
Total cost (Baht**)**	**12,148.34**	**11,780.36**

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Table 9 **The direct medical cost in patient's perspective: Statistical significance**

	TURP	TUIP	P value*
Total cost			
Mean (Baht)	12,148.34	11,780.36	p = 0.071
[95% CI]	[11,798.23-12,498.45]	[11,446.19-12,114.52]	

* Mann-Whitney U test

The direct medical cost of the TURP group was 12,148.34 Baht compared to 11,780.36 Baht in the TUIP group. There was no statistical significant difference between both procedures ($p > 0.05$) **(table 9)**. The cost of TUIP group seemed less in the cost of materials used and treatment of late complications but more in the cost of treatment of early complications. The cost for hospitalization, laboratory test, operation charge and cost at OPD were quite the same**.(table 8)**

5.2.5 Cost-effectiveness analysis

There were many formulae to calculate the cost-effectiveness of prostate treatment. We adopted the formula proposed by the international committee on economics for the 4th international consultation on BPH[18] which was the organization under WHO support. This indicator called " The quality of life/ Symptom improvement outcome costs coefficient (Q-SOCC)" and its formula was

Money spent per point of improvement

$$= \frac{\text{Total direct cost}}{\text{change in IPSS + change in QOL * 7 (weight factor)}}$$

The results were shown in **table 10**

Table 10 **Cost-effectiveness analysis (Q-SOCC)**

	TURP	**TUIP**	**P value***
Mean (Baht)	352.63	397.49	p = 0.035
95% CI	[247.65-457.62]	[340.12- 454.85]	

* Mann-Whitney U test

The money spent per point of improvement was 397.49 Baht in TUIP group compared to 352.63 Baht in TURP group. The cost-effectiveness in term of money spent per point of improvement was significantly less in TURP group ($p<0.05$).

CHAPTER 6

DISCUSSION AND CONCLUSION

6.1 DISCUSSION

Various treatment alternatives exist for bladder outlet obstruction secondary to Benign Prostatic Hyperplasia (BPH). Among the transurethral operations, resection and incision of the prostate, respectively, are performed quite commonly.

Since Orandi[5] first described transurethral incision of the prostate (TUIP) as a treatment for obstructive prostatic enlargement, numerous reports have appeared in the literature attesting to its efficacy[7],[11],[12],[19],[20]. However, comparisons between TURP and TUIP procedures in the past were hampered by study design, variability in patient selection (principally prostate size and age), technique of transurethral resection and lack of objective postoperative criteria for improvement. Some studies were not randomized or did not include uroflowmetric analysis[5],[11],[19],[20] and most studies were uncertain about prostate size that should appropriate to TUIP.

This randomized prospective study compares the subjective and objective improvements resulting from TUIP with that of TURP in the BPH patients with estimated prostatic weight by transrectal ultrasonography (TRUS) of 50 Grams or less. We also include the economic implications such as comparisons of cost and cost-

effectiveness analysis between these two procedures using data from the randomized controlled trial.

For efficacy, no technique can be declared a success unless the patient himself is satisfied with the results. We consider the improvement in symptom score, which is patient subjective evaluation and possibly the best way to summarized outcome of BPH treatment, as the main outcome. Both TUIP and TURP procedures are effective in relieving symptoms of bladder outlet obstruction as measured by regression in severity of the symptom score. The IPSS score decrease from 23.0 points to 8.7 points at 12 weeks postoperatively in TUIP group and from 24.0 points to 8.5 points in TURP group. There is no significant difference in the change of symptom score from baseline at 12 weeks postoperatively ($p>0.05$). Thus, we consider that both techniques appear to be comparable effective in reducing both obstructive and irritative BPH symptoms.

Improvement in maximum urinary flow rate is seen in both groups. The peak urinary flow rate increases from 5.3 ml/sec to 13.8 ml/sec in TUIP group and from 5.7 ml/sec to 18.9 ml/sec in TURP group at 12 weeks postoperatively. However, the change of maximum flow rate from baseline at 12 weeks postoperatively is higher in TURP group than in TUIP group (13.2 ml/sec versus 8.5 ml/sec ; $p < 0.05$). This finding probably does not present a clinical significant effect since both groups have maximum flow rate above levels usually observed in urodynamically obstructed patients.

For safety outcomes, TUIP is generally accepted by most urologists to be a simple procedure to perform and to train. The results reported herein confirm this

impression. TUIP is much faster than the average resection. The operation time in TUIP group is 13.43 minutes compares to 34.21 minutes for TURP group ($p<0.001$). A considerable saving in terms of irrigation fluid used is also achieved (mean volumes 3.77 Litres and 12.85 Litres for TUIP and TURP groups respectively). There is no patients required blood transfusion in both incision and resection in this study. By contrary, in many previous studies, the lack of hemorrhage after TUIP was a major advantage over TURP[11],[14],[15],[21]. Anyhow, in our study, blood transfusion requirement is determined by the anesthetists who judge by clinical observation intra- and immediate postoperatively and is checked by examination of blood hemoglobin and hematocrit at 24 hours postoperatively which showed no significant change from preoperative period.

Our results show that there was no difference in days with catheter and the average hospitalization in both groups. It has been reported earlier that TUIP could reduce the period of catheter drainage and hospital stay when compared with TURP.[15],[22] Both of these factors may relate to our rule for (at least)two to three days catheterization period postoperatively. Our catheterization period in TURP group is similar to earlier report (average 2.79 days compared to 2.50 days in Riehmann's paper[15]) but in TUIP group, ours is somewhat longer (2.60 days compared to 1.40 days[15]). If we strict to the criteria that the catheter would be remove whenever the urine appears to be clear, the catheterization period and also the postoperative hospitalization in the TUIP group might be shorter than these.

For complication rate, both early and late complications except retrograde ejaculation are comparable in both groups. TUIP seemed to have more incidence of

early postoperative complications such as clot retention and urinary retention requiring re-catheterization (not statistically significant, though). Some papers in the past mentioned that TUIP had less early complications compared to TURP[10],[15] but all of those papers recruited only patients with small prostate size i.e. less than 30 grams. Our study selects the patients with prostate of 50 grams or less and average prostatic weight in the study is around 30 grams. The incision procedure is considered by some as being difficult to perform and associated with increased complication in large prostate gland[12],[20].

Concerning late complications, the urinary incontinence which occurred in both groups (2cases in TURP group and 1 case in TUIP group) were all urge incontinence which could be the effect of associated bladder instability. This condition (bladder instability) is not uncommon in case of long standing urinary outflow tract obstruction by BPH and could be treated successfully by anticholinergic drugs. Our study shows that the incidence of retrograde ejaculation after TURP is significantly higher than after TUIP (31% versus 0%). This confirms the experience of Orlandi[12], Reihmann[15], Soonawalla[14] and Dorflinger[23].The metaanalysis study done by the Benign Prostatic Hyperplasia Guideline Panel [24] revealed that retrograde ejaculation in TUIP group was 6%-55% (presented as 90% CI) compare to 25%-99% in TURP group. They also reported that impotence post TUIP was 4.0%-24.4% compared to 3.4%-32.4% in TURP group which is not statistically significant. Since retrograde ejaculation after TURP is higher, **the incision procedure might preferentially be performed in younger patients whom sexual performance is of concern.**

For cost and cost-effectiveness analysis, the direct medical cost in patient's perspective of both groups are comparable. The cost of hospitalization is similar because it is calculated from length of hospital stay which is comparable in both groups. The operation charge and cost at OPD are quite the same. The cost of TUIP seemed less in the cost of materials, especially irrigation fluid, used but more in the cost of treatment of early complications. However, when we calculated the money spent per point of improvement by the formula of "The quality of life / symptom improvement outcome costs coefficient (Q-SOCC)", the result of cost-effectiveness analysis still in favor of TURP.

6.2 CONCLUSION

TURP has been, and still is, the gold standard treatment for men with bladder outlet obstruction from BPH, in whom an indication for surgical intervention exists. However, if the patient has a prostate with an estimated size less than 50 Grams and prefers a procedure that (1) has similar efficacy as TURP, (2) gives him a better chance of retaining ejaculatory function, then TUIP should be considered. Furthermore, TUIP has the advantage of shorter operation time and less irrigation fluid used compared with TURP.

At present, new minimal invasive techniques have been introduced (laser prostatectomy, thermotherapy, TUNA). In the future, the randomized controlled trials comparing these procedures with TUIP would be of interest.

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APPENDICES

The WHO-recommended symptom score sheet

	Not at all	Less than 1 time in 5	Less than half the time	About half the time	More than half the time	Almost always
1. Over the past month or so, how often have you had a sensation of not emptying your bladder completely after you finished urinating?	0	1	2	3	4	5
2. Over the past month or so, how often have you had to urinate again less than two hours after you finished urinating?	0	1	2	3	4	5
3. Over the past month or so, how often have you found you stopped and started again several times when you urinated?	0	1	2	3	4	5
4. Over the past month or so, how often have you found it difficult to postpone urination?	0	1	2	3	4	5
5. Over the past month or so, how often have you had a weak urinary stream?	0	1	2	3	4	5
6. Over the past month or so, how often have you had to push or strain to begin urination?	0	1	2	3	4	5
7. Over the past month or so, how many times did you most typically get up to urinate from the time you went to bed at night until the time you got up in the morning?	0 times	1 time	2 times	3 times	4 times	≥5 times
Total I-PSS score, S =						

Quality of life due to urinary symptoms

	Delighted	Pleased	Mostly satisfied	Mixed	Mosty dissatisfied	Unhappy	Terrible
1. If you were to spend the rest of your life with your condition just the way it is now, how would you feel about it?	0	1	2	3	4	5	6
Quality of Life Assessment Index, L =							

แบบประเมินการถ่ายปัสสาวะ

ชื่อ .....อายุ.....ปี วันที่.....

ในช่วง 1เดือนที่ผ่านมา ท่านมีอาการต่อไปนี้ บ่อยมากน้อยเพียงไร โปรดทำเครื่องหมาย O ล้อมรอบตัวเลขในช่องที่ตรงกับอาการที่ปรากฏ

	ไม่มีอาการเลย	มีอาการน้อยกว่า 1ใน5ครั้ง	มีอาการน้อยกว่าครึ่งหนึ่ง	มีอาการประมาณครึ่งหนึ่ง (5ครั้งในการถ่ายปัสสาวะ10ครั้ง)	มีอาการมากกว่าครึ่งหนึ่ง	มีอาการบ่อยมากเกือบทุกครั้ง
1. รู้สึกถ่ายปัสสาวะไม่สุดหรือเหลือค้างหลังจากถ่ายเสร็จแล้ว	0	1	2	3	4	5
2. ถ่ายปัสสาวะบ่อย ๆ ห่างกันไม่ถึง 2 ชั่วโมง	0	1	2	3	4	5
3. ถ่ายปัสสาวะกะปริดกะปรอยคือถ่าย ๆ หยุด ๆ หลายครั้ง	0	1	2	3	4	5
4. เมื่อปวดปัสสาวะแล้วกลั้นไม่ได้ต้องรีบเข้าห้องน้ำ	0	1	2	3	4	5
5. ปัสสาวะไม่พุ่ง ลำปัสสาวะอ่อนลง	0	1	2	3	4	5
6. ต้องเบ่ง หรือรอนานก่อนจะถ่ายปัสสาวะออกมาได้	0	1	2	3	4	5
7. เมื่อนอนหลับแล้ว ต้องลุกขึ้นถ่ายปัสสาวะกลางดึกกี่ครั้ง ก่อนตื่นนอนตอนเช้า	0 ครั้ง	1 ครั้ง	2 ครั้ง	3 ครั้ง	4 ครั้ง	5 ครั้งหรือมากกว่า

(Total IPSS Score =.....)

	ชอบมาก	ชอบ	ค่อนข้างพอใจ	ไม่แน่ใจ	ค่อนข้างไม่พอใจ	ไม่มีความสุข	ทนไม่ได้
1.ถ้าท่านต้องอยู่กับการถ่ายปัสสาวะเช่นที่เป็นในปัจจุบันนี้ ไปตลอดชีวิต ท่านจะรู้สึกอย่างไร ?	0	1	2	3	4	5	6

(QOL index = ...)

APPENDIX II

Data Collection Form

Code for fill-in blanks : 9 = missing, unknown or not performed

ID No..... Name..... .....Hospital No..... ....

Address (ที่ติดต่อได้แน่นอน) ....

Baseline data

1. ID No	.....	1 ☐☐☐
2. Hosp. No	....	2. ☐☐☐☐☐☐ / ☐☐
3. Age	.....Years	3. ☐☐
4. Weight	.....Kgs.	4. ☐☐☐
5. Presented with acute urinary retention	☐ 1. No ☐ 2. Yes	5. ☐
6. Estimated prostatic weight	.....ml(g)	6. ☐☐☐.☐
7. Hemoglobin	.....g/dl	7. ☐☐.☐
8. Hematocrit	.....%	8. ☐☐
9. Serum creatinine	.....mg/dl	9. ☐☐.☐
10.Serum sodium	.....mEq/L	10. ☐☐☐
11.Serum PSA	.....ng/dl	11. ☐☐☐.☐
12. Urine culture	☐ 1. No growth ☐ 2. .....(type of bacteria)	12. ☐
13.IPSS score	.....	13. ☐☐
14.QOL score	.....	14. ☐
15.Max. flow rate	.....ml/sec	15. ☐☐.☐
16.Voided volume	.....ml	16. ☐☐☐

Outcomes

During admission

17. Operation time ....min 17. ☐☐
18. Volume of irrigation fluid use ....ml 18. ☐☐☐☐
19. Hemorrhage requiring transfusion ☐ 1. No ☐ 2. Yes 19. ☐
20. Hemoglobin (24hr.post-op) .....g/dl 20. ☐☐.☐
21. Hematocrit (24hr.post-op) .....% 21. ☐☐
22. Serum sodium (24hr.post-op) .....mEq/L 22. ☐☐☐
23. Serum creatinine (24hr.post-op) .....mg/dl 23. ☐☐.☐
24. Complications ☐ 1. No ☐ 2. Clot retention 24. ☐
☐ 3. Urinary retention
☐ 4. Urinary incontinence
☐ 5. Others (specify).....

At 4 weeks post-operative

25. Urine culture ☐ 1. No growth 25. ☐
☐ 2. .....(type of bacteria)
26. Complications ☐ 1. No ☐ 2. Clot retention 26. ☐
☐ 3. Dysuria ☐ 4.Urinary retention
☐ 5. Urinary incontinence
☐ 6. Retrograde ejaculation
☐ 7. Impotence
☐ 8. Others (specify).....

At 12 weeks post-operative

27. Hemoglobin .....g/dl 27. ☐☐.☐
28. Hematocrit .....% 28. ☐☐
29. Serum sodium .....mEq/L 29. ☐☐☐
30. Serum creatinine .....mg/dl 30. ☐☐.☐
31. Urine culture ☐ 1. No growth 31. ☐☐.☐
☐ 2. .....(type of bacteria)
32. IPSS score ..... 32. ☐☐
33. QOL score ..... 33. ☐
34. Max. flow rate .....ml/sec 34. ☐☐.☐
35. Voided volume .....ml 35. ☐☐☐
36. Complications ☐ 1. No ☐ 2. Urinary retention 36. ☐
☐ 3. Urinary incontinence
☐ 4. Retrograde ejaculation
☐ 5. Impotence
☐ 6. Others (specify).....

APPENDIX III
Cost Analysis

ID No..... Name.....Hospital No.....

Items	Cost per unit	No of unit used	Cost per item	Total
1. Hospitalization	700/day	.....	.....	.....
2. Laboratory Tests				
2.1 CBC	50	3	150	
2.2 Serum BUN, Cr, Electrolyte	120	3	360	
2.4 Serum PSA	200	1	200	
2.5 UA and Urine culture	150	3	450	
2.7 Uroflowmetry	200	2	400	
2.8 TRUS	500	1	500	2,060
3. Operation charges				
3.1 OR fee	4,000		4,000	
3.2 Spinal block or GA	2,000 or 3,000		.....	.....
4. Materials				
4.1 Irrigation fluid (sterile water)	46/1,000ml	.....	.....	
4.2 Drugs				
Ceftriaxone (IV)	136/g	1	136	
Pethidine (50 mg)	20	.....	.....	
Norfloxacine (400mg)	2.50	10	25	.....
5. Treatment of complications				
5.1 Clot retention	500	.....	.....	
5.2 Urinary retention	100	.....	.....	
5.3 Urinary tract infection	300	.....	.....	
5.4 Urinary incontinence	1,000	.....	.....	
5.5 Retrograde ejaculation	100	.....	.....	
5.6 Impotence	1,000	.....	.....	.....
6. Cost at OPD				
6.1 Transportation	150	2	1	
6.2 OPD fee	20	1	20	320
TOTAL COST				.....

VITAE

Kriangsak Prasopsanti was born on 12 September 1957 at Chainat Province, Thailand. He graduated from Faculty of Medicine, Chulalongkorn University and earned the degree of Doctor of Medicine (M.D.) in 1981. He graduated Thai Board of General Surgery in 1987 and Thai Board of Urology in 1989. Since then, he has been working as the staff of Urological Unit, Department of Surgery, Faculty of Medicine, Chulalongkorn University.

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