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# NEW NONINVASIVE TREATMENT OF PROSTATE CANCER WITH HIGH-INTENSITY FOCUSED ULTRASOUND (HIFU)

Following the diagnosis of Carcinoma prostate, patients are often confused by a wide range of treatment options offered to treat their disease. Both radical prostatectomy (RP) and external-beam radiotherapy (EBRT) have been shown to offer excellent long-term cancer control but are often associated with considerable side effects<sup>1</sup>.

Standard treatment options such as RP and EBRT compete with various alternative options such as brachytherapy, cryotherapy, and high-intensity focused ultrasound (HIFU). What is the rationale to establish and favor carcinoma prostate treatment options other than RP and EBRT? It is mainly the physician's and the patient's quest to balance invasiveness, preservation of continence, and potency in combination with sufficient cancer control (i.e., the trifecta).

HIFU has been continuously developed and refined since the mid-1990s. The technology is based on ultrasound waves emitted from a transrectal transducer and focused on a target point with the immediate effect of coagulation necrosis in conjunction with limited damage to the surrounding tissue<sup>2</sup>.

Obvious advantages demonstrated in the literature to date over EBRT are a short treatment period, short time to reach the PSA nadir, and several options for retreatment such as re-HIFU, salvage radiation, and salvage RP in case of local disease resistance or recurrence.

HIFU is approved in Canada, Europe, and Asia and has gained acceptance by the US Food and Drug Administration via an Investigational Device Exemption for a phase 3 clinical trial. European urologic associations make conflicting recommendations. HIFU is recommended in Italy, the United Kingdom, and France for selected patients. The French Association of Urology recommends HIFU as primary therapy for Carcinoma prostate in older patients (>70 yr) with T1–T2 N0M0 disease, Gleason score <7, PSA level <15 ng/ml, and a prostate volume of <40 ml<sup>3</sup>. In contrast, the German association is among those not yet recommending the routine use of HIFU in Carcinoma prostate.

What are the main reasons for patients to choose HIFU instead of standard treatment in primary CAP? It is the

expectation of less invasiveness and unaltered quality of life. These expectations are driven by Web-based patient information with statements such as, "HIFU is an effective, non-invasive treatment that preserves the patient's quality of life"<sup>4</sup>.

But do we currently have sufficient data to prove this? Overall and cancer-specific control is yet to be determined for HIFU, as the longest median follow-up for a multicentre series so far is  $6.4 \pm 1.1$  yr<sup>5</sup>. In addition, there is no accepted standard definition of post-HIFU biochemical failure. A HIFU-specific failure definition (i.e., Stuttgart criteria) has been proposed but has not yet been validated<sup>6</sup>.

What about side effects and quality of life? There are sufficient data on treatment safety with a treatment mortality of zero and low rectal toxicity with new-generation devices<sup>4</sup>. In comparison with RP, there seems to be a lower degree of stress urinary incontinence but a significantly higher rate of formation of bladder outlet obstruction<sup>7</sup>. Is there enough evidence to support superior outcome for potency? Rates for erectile dysfunction range from 20% to 49.8%. These data are controversial and limited by several facts; few of the studies used validated questionnaires before and after treatment. Most of men treated with HIFU were of advanced age, which is known to be associated with impaired baseline potency status. Some of the authors even present data following nerve-sparing HIFU; however, there is neither a clear definition nor a recommendation to treat in a non-full-gland-ablation approach outside of clinical trials. We feel that patients have to be informed about possible permanent damage to erectile function following full-gland HIFU treatment.

Against the background of the above-mentioned expectations in combination with controversial data, Warmuth et al are to be congratulated for their review of the efficacy and safety of HIFU for the primary and salvage treatment of CAP<sup>8</sup>. They conducted an extensive systematic literature search considering only prospective studies with >50 patients and assessed their quality using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE)

approach. Using the GRADE approach, they concluded that the available evidence on efficacy and safety of HIFU in CAP is of very low quality, mainly due to the lack of controlled studies.

Although quality and extensiveness of the review are remarkable, we would like to comment on some points. Why have studies with <50 patients not been included? Valuable information might have been missed. The “lack of control groups” is a problem for all accepted prostate treatments of localized CAP. Radical Prostatectomy is the only treatment option that was compared in a randomized controlled manner with watchful waiting<sup>9</sup>.

It is important to note that 100 yr since the invention of RP, which is unquestionably the gold standard treatment for CAP, the highest-quality data allow one to conclude definitively that RP may be superior to watchful waiting. For prostate HIFU, which was invented about <20 yr ago, two US-based controlled trials are ongoing. One study compares HIFU with brachytherapy in organ-confined CAP with the primary end point being absence of biochemical failure at 24 months (NCT00770822). Another study compares biochemical outcome through a 24-month period between HIFU and cryotherapy (NCT00295802).

Warmuth et al's criticism regarding the lack of overall and cancer-specific survival data is justified, but one has to consider that HIFU is too new to draw any conclusions about its long-term cancer control. In addition, one has to be aware that sufficient oncologic follow-up data are not even available for intensity-modulated radiation therapy, brachytherapy, high-dose-rate techniques, or cryoablation and even laparoscopic and robot-assisted RP<sup>9</sup>. Therefore, we agree with Warmuth et al when they conclude that most of the limitations reported for HIFU also apply for all techniques of definitive CAP treatment.

One interesting future application of HIFU is focal therapy. HIFU offers the technology to discretely treat focal areas within the prostate with the aim of minimal side effects and leaves all options of secondary treatment such as re-HIFU, RP, and EBRT in case of subsequent disease progression. Currently, focal therapy in CAP is more a concept than a treatment option. There is not even a clear definition of *focal therapy* because it comprises hemi ablation, three-quarter ablation, index-lesion ablation, and true lesion plus margin focal ablation of CAP. Initial patient series are promising but patient numbers are still too small and follow-up too short to draw any valid conclusions about the oncologic efficacy and

advantage of focal therapy in comparison with full ablation treatment options or active surveillance<sup>10</sup>. Due to its highly experimental character, focal therapy in CAP should only be performed within well-designed studies. Beside oncologic safety, our interest should focus on the true benefit for quality of life when compared with both active surveillance and ablative treatment. A number of recruiting trials focus on side effects following focal or hemi ablation treatment in CAP patients. It is expected that in the near future, there will be more valuable data on quality of life following focal HIFU treatment than for full-gland ablation.

Although HIFU is an emerging technology in CAP treatment, the review by Warmuth et al presents a disillusioning picture of the quality of current HIFU data. What can we expect from scientific work on HIFU for the next years? Concerning full-gland ablation, we expect data from the ongoing comparative trials as well as the first real “long-term” data to emerge from multicentre series. Parallel to that, there will be early results from focal therapy trials. Because most of the current studies use a hemi ablation protocol, further technical advances are expected with improved CAP imaging, allowing for real focal therapy, even in multifocal-pattern CAP.

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### Prof. MA Salam

Editor

Bangladesh Journal of Urology

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## ORIGINAL ARTICLES

# THE COMPARISON AND EFFICACY OF NIFEDIPINE AND TAMSULOSIN FOR THE MANAGEMENT OF LOWER URETERIC STONES

MS ISLAM<sup>1</sup>, MW ISLAM<sup>2</sup>, MN HOODA<sup>3</sup>, AKMK ALAM<sup>4</sup>, GM CHOWDHURY<sup>4</sup>, IA SHAMEEM<sup>4</sup>

### Abstract

**Purpose:** To evaluate and compare the effectiveness of 2 different medical therapies during watchful waiting in patients with lower ureteric stones.

**Materials and Methods:** A total of 98 patients with stones less than 1 cm located in the lower ureter (juxtavesical or intramural tract) were enrolled in the study and were randomly divided into 3 groups. Group 1 (33) patients received 1 daily oral therapy of 0.4 mg tamsulosin (maximum 28 days), group 2 (33) received 20 mg nifedipine slow-release (maximum 28 days) and group 3 patients (32) were used as controls. Statistical analyses were performed using Student's test, ANOVA test and chi-square test.

**Results:** Of the 98 enrolled patients 91 completed the study. The average stone size for groups 1 to 3 was 5.89, 6.01 and 5.80 mm, respectively, which was not statistically significant. Expulsion was observed in 27 of 32 patients in group 1 (84.38%), 22 of 31 in group 2 (70.97%) and 13 of 28 in group 3 (46.43%). The difference in groups 1 and 2 with respect to group 3 and between groups 1 and 2 was significant. Average expulsion time for groups 1 to 3 was 7.9, 9.3 and 12.8 days, respectively. A statistically significant difference was noted between groups 1 and 3. Mean diclofenac sodium dosage per patient in groups 1 to 3 was 17.5, 24.5, and 100.5 mg, respectively. A statistical significant difference was observed between groups 1 and 2 with respect to group 3.

**Conclusions:** Medical treatments with nifedipine and tamsulosin proved to be safe and effective as demonstrated by the increased stone expulsion rate and reduced need for analgesic therapy. Moreover medical therapy, particularly in regard to tamsulosin, increased expulsion rate reduced expulsion time.

**Key Words:** Ureter, urinary calculi, nifedipine, tamsulosin.

### Introduction

Urinary stone disease is a common condition affecting up to 12% of the world population. Among all ureteral stones, 70% are found in the lower third of the ureter.<sup>1-3</sup> Ureteral stones occupy an important place in daily

urological practice, and clinicians are frequently asked to choose adequate treatment.<sup>4</sup> The efficacy of mini-invasive therapies, such as extracorporeal shock wave lithotripsy and ureteroscopy has been proven by several studies.<sup>5,6</sup> Nevertheless these techniques are not risk-free, are problematic and are quite expensive.<sup>7</sup> On the other hand, a watchful waiting approach can be used in a large number of cases, as demonstrated by several studies that revealed spontaneous passage rates of up to 98% for small distal ureteral stones.<sup>8-10</sup> Moreover, even the simple watchful waiting approach can result in complications, such as infection of the urinary tract, hydronephrosis and renal function effects.<sup>9</sup> Therefore, it is difficult to choose between mini-invasive therapies and a watchful-waiting approach, especially when patients report few symptoms and/or stones are small. Recently, use of the watchful waiting approach has been extended by using pharmacological therapy, which can reduce symptoms and facilitate stone expulsion.<sup>11-14</sup> Several factors thought to influence the spontaneous passage of ureteral stones, such as stone size, configuration and location, smooth muscle spasm, submucosal edema, and anatomy.<sup>10,15</sup> To achieve the spontaneous passage,  $\alpha$ -adrenergic blockers, calcium channel blockers, prostaglandin synthesis inhibitors, glyceryl trinitrate and steroid treatment to relieve edema are being used.<sup>12,16</sup> The density of  $\alpha$ -1-adrenergic receptors in ureteral smooth muscle cells is significantly higher than another adrenergic receptors. Furthermore,  $\alpha$ -1-adrenergic antagonists have proved to inhibit basal tone, peristaltic frequency and ureteral contractions even in the intramural tract. Therefore, we decided to perform a comparative study to evaluate the safety and effectiveness nifedipine and tamsulosin therapies for the treatment of lower ureteral stones.

### Material and Methods

A total of 98 patients with distal ureteral stones (juxtavesical tract and ureterovesical junction), 1 cm or less in size were included in the study. Study was conducted from July 2007 to December 2008. Of the 90 patients, 51 were men and 39 were women. The patient age range was 15 to 57 years (mean 34.5). The patients who had urinary tract infection, severe hydronephrosis, a solitary kidney, an extra stone in the upper urinary

system, undergone previous surgery for a urinary system stone, a nonopaque stone, or diseases such as diabetes or hypertension; who were pregnant; and those whose renal reserve was reduced by more than 50% were excluded from the study. Stone presence and characteristics were diagnosed with abdominal ultrasonography, x-ray of the kidneys, ureters and bladder and excretory urography were used when necessary. Complete blood cell count, serum creatinine, urinalysis done in every case.

A total of 98 patients were randomly divided into group 1 (33 patients), group 2 (33) and group 3 (32). After randomization to one of 3 groups, the patients received treatment. Group 1 patients received tamsulosin 0.4 mg/day, group 2 patients received nifedipine 20 mg/day (slow release preparation), and group 3 patients did not receive any medical treatment for expulsion (control group). In addition, all patients were treated with prophylactic antibiotic therapy (Ciprofloxacin 500 mg, twice a day) and received 2500 mL hydration daily. The groups received medical treatment for a maximum of 4 weeks. The patients were called for weekly checkups and were followed up weekly with renal ultrasonography, X-ray KUB, urinalysis, and serum creatinine measurements. Diclofenac sodium was recommended for routine use during pain episodes, and patients were requested to record the dose used. During the study, the patients who had attacks of uncontrollable renal colic, whose urosepsis developed, or whose serum creatinine level exceeded 2 mg/dL were excluded from the study. Patients in whom spontaneous passage did not occur by the end of the study underwent ureteroscopy and intracorporeal pneumatic lithotripsy. Statistical analyses were performed with Student's *t* test and chi-square test using the parameters of stone size, expulsion rate and time to expulsion.

**Results**

Of the 98 enrolled patients 91 completed the study. One patient in group 2 (1.02%) had to cease medical therapy due to side effects. One patient in group 1 (1.02%), and one patient in group 2 (1.02%) four patient in group 3

(4.08%) lost from follow-up therefore, dropped out of this study. Finally group 1 consisted of 20 men and 12 women (mean age 46.6 years), group 2 consisted of 21 men and 10 women (47.4 years) and group 3 consisted of 17 men and 11 women (42.8 years). No significant statistical difference was observed in patient age and gender distribution ( $p = 0.3$ ).

Mean stone size was 5.89 mm (3 to 10) for group 1, 6.01mm (3.5 to 10) for group 2 and 5.80 mm (3.3 to 10) for group 3. ANOVA test and Student's *t* test did not reveal any significant statistical difference among the groups ( $p = 0.2$ ).

Stone expulsion was observed in 27 patients in group 1 (84.38%), 22 in group 2 (70.97%) and 13 in group 3 (46.43%). Group 1 showed a significantly higher stone expulsion rate compared with groups 2 and 3 ( $p < 0.05$ ). Compared with group 3 the higher expulsion rate reported in group 2 was statistically significant ( $p < 0.05$ ).

Average time to expulsion was 7.9 days (1 to 14) in group 1, 9.3 days (3 to 21) in group 2 and 12.8 days (4 to 28) in group 3. A significant statistical difference was observed in times to expulsion between groups 1 and 3 ( $p < 0.05$ ) whereas no significant statistical difference was noted between groups 1 and 2 ( $p = 0.2$ ) and between groups 2 and 3 ( $p = 0.09$ ).

Mean diclofenac sodium dosage was 17.5 mg (0 to 150) per patient in group 1, 24.5 mg (0 to 150) in group 2 and 100.5 mg (0 to 400) in group 3. No significant statistical difference was observed between groups 1 and 2 ( $p = 0.03$ ) while it was noted between groups 1 and 3 and groups 2 and 3 ( $p < 0.05$ ). No patient was hospitalized for recurrent colic, no urosepsis was recorded and no narcotics drugs were administered.

Only 1 group 2 patient experienced serious side effects associated with the medical expulsive therapy (hypotension and palpitations). Patients (5 in group 1, 9 in group 2 and 15 in group 3) who were not stone-free after the 4 weeks of follow up were successfully treated with ureteroscopy and intracorporeal pneumatic lithotripsy.

**Table-I**  
*Demographic data of the 3 groups*

	Group 1	Group 2	Group 3
Number of patients	32	31	28
Mean age (years)	46.6	47.4	42.8
Sex M/F	20/12	21/10	17/11
Stone size (mm)	5.89 (3 to 10)	6.01 (3.5 to 10)	5.80 (3.3 to 10)
Expulsion rate	84.38% (27)	70.97% (22)	46.43% (13)
Time of expulsion (days)	7.9 (1 to 14)	9.3 (3 to 21)	12.8 (4 to 28)
Mean diclofenac sodium (mg per patient)	17.5 (0 to 150)	24.5 (0 to 150)	100.5 (0 to 400)

## Discussion

There are some options for the treatment of distal ureteric stone. ESWL is a noninvasive procedure but it implies relatively high costs and a relevant percent of re-treatments. URS is an invasive procedure that provides the highest success rate and, according to some groups, it represents first choice therapy.<sup>7,17</sup> However, the choice of treatment for a distal ureteric stone often depends on clinical, socioeconomic, ethical and even business conditions.<sup>18</sup> Furthermore, some conservative pharmacological approaches have been proposed in recent years. Some groups have focused their studies only on the control of analgesic symptoms, whereas others have suggested the use of drugs that can modify ureteric motility. These agents have been used to decrease obstruction induced, phasic peristaltic contractions and maintain tonic contractions, which would allow distal migration of the stone. In addition, some groups also combine antiedemic use to prevent ureteric edema under the stone and/or antibiotic treatment to prevent infection consequent to urinary stasis from causing alterations in ureteric motility.<sup>11,12,19</sup>

In our randomized trial we compared the clinical efficacy of 2 drugs that can act on ureteric smooth muscle with each other and with control group. Each was associated with the same treatment regimen with antibiotic and analgesics. Nifedipine, is a calcium antagonist. Its use in distal ureterolithiasis has been tested in various studies, which have demonstrated its excellent efficacy for inducing stone expulsion and relieving pain.<sup>11,12</sup> In this study tamsulosin, a selective  $\alpha 1A$  adrenergic antagonist, which we recently used to treat this disease, achieving unexpected and startling results. The rationale for its use for this pathological condition was taken from several studies, as previously described.<sup>16,20,21</sup>

In our study spontaneous stone expulsion rate is 46.43%. Based on literature data the distal ureteral stone expulsion rate produced by a watchful waiting approach is 25% to 54% with a mean expulsion time of greater than 10 days and considerable analgesic use even for stones less than 4 mm.<sup>5,6</sup> Ueno et al reported a spontaneous stone expulsion rate of 57% for 5 mm stone.<sup>9</sup> Francesco et al reported a spontaneous stone expulsion rate of 43% for stone 10 mm or less.<sup>22</sup> However, Morse and Resnick reported that a 6 mm stone in the distal ureter was spontaneously expelled in 35% of cases at the expense of recurrent ureteral colic.<sup>23</sup> With regard to the primary end point of our trial all 2 drugs compared in our study proved to be superior to the watchful waiting approach. In addition, the results of

our trial confirm the excellent efficacy of tamsulosin in favoring the rapid expulsion of ureteric stones, clinically supporting the validity of the hypothesis of the role of  $\alpha$ -adrenergic receptors in the physiology of ureteric motility and the pathophysiology of renal colic.<sup>20,21</sup>

The group treated with nifedipine achieved better results than control group thus, confirming the efficacy of this molecule. In particular our trial shows that nifedipine therapy resulted in a decreased need for analgesics and endoscopic procedures compared with control group. Borghi et al demonstrated the beneficial effect of calcium antagonist (nifedipine) in reducing time to stone passage and improving expulsion rates.<sup>11</sup> In an experience with nifedipine, this expulsive therapy was safe and effective as demonstrated by the increased expulsion rate, decreased expulsion time and reduced need for analgesic therapy with respect to our control group.<sup>12</sup> Bajor showed that  $\alpha$ -blocker reduced the time for stone passage from 11 to 5.2 days in 86 patients with lower ureteric stones without encountering any serious side effects.<sup>24</sup>

On the basis of the evidence that  $\alpha$ -1 receptors have an important role in expulsion of lower ureteral physiology, some authors have more recently proposed the use of  $\alpha$ -1 blockers with the aim of facilitating lower ureteral stone expulsion.<sup>13,14,25,26</sup> In particular Ukhal et al reported positive results in accelerating lower tract ureter stone passage (juxtavesical tract and ureterovesical junction) using  $\alpha$ -1 blockers.<sup>14</sup> Cervenakov et al in a randomized study registered a significant statistical difference in stone expulsion rate between the group treated with tamsulosin and the control group.<sup>13</sup> Similar results have been reported in a recent study.<sup>16</sup>

To our knowledge, few studies exist that investigate different expulsive medical therapies, which lead us to our current comparative study of the safety and effectiveness of nifedipine versus tamsulosin for the treatment of lower ureteral stones. We used nifedipine based on our historical positive results and tamsulosin was used based on the literature and  $\alpha$ -1 receptors selectivity.<sup>11-14</sup> Our study was limited to patients affected by lower ureteral stones (juxtavesical tract and ureterovesical junction) with size equal to or less than 10 mm. The success of these particular medical therapies for this kind of stone was encouraging, and we were further motivated by the positive results with tamsulosin due to the higher density of  $\alpha$ -1 receptor in the lower part of the ureter.<sup>25,26</sup> We decided on a

maximum observation period of 4 weeks because longer periods can increase complication rates by up to 20%.<sup>8</sup>

The medical therapy based on a nifedipine (group 2) demonstrated positive results in 70.97% of patients, whereas tamsulosin (group 1) demonstrated positive results in 84.38% of patients. These figures demonstrate a significant difference. However, differences were also evident in stone expulsion between groups 1 and 3 (84.38% versus 46.43%) and between groups 2 and 3 (70.97% versus 46.43%). These results confirmed that medical therapy with either nifedipine or tamsulosin can improve stone expulsion. As far as expulsion time was concerned, we observed spontaneous stone passage after 7.9 days in group 1, 9.3 days in group 2 and 12.8 days in group 3. A significant statistical difference was noted between groups 1 and 3. The results demonstrate that use of tamsulosin reduced expulsion times significantly in respect to the control group (3) and confirm the positive results obtained in reducing stone passage times by others.<sup>8, 13, 14</sup> Adding also the fact that the percentage of expulsion rate were greater in group 1, in comparison to group 2, we hypothesize that tamsulosin is more effective for the treatment of this type of ureteric stone than nifedipine. Further evaluation using larger groups will provide an opportunity to confirm these findings.

Moreover, nifedipine and tamsulosin was effective in pain reduction and decreased the amount of analgesic administered as demonstrated by information gathered from groups 1 and 2 with respect to quantities administered to patients in group 3. We encountered one case of serious side effects of medical expulsive therapy (hypotension accompanied by palpitations), which required its suspension. Minor therapy related side effects were observed in patients (2 in group 1, 3 in group 2) but they were able to complete the study. Six patient lost from follow-up (one from group 1, 1 from group 2 and four from group 3). With regard to safety, both combinations were well tolerated by the patients. Patients who were not stone-free after the 4-weeks of follow-up were successfully treated with ureteroscopy and intracorporeal pneumatic lithotripsy. These data demonstrate that neither watchful waiting nor medical therapy seems to negatively affect the success rate of stone removal.

### Conclusions

The results of this study indicate that lower tract ureteral stones can be treated with an expulsive medical therapy in patients when a watchful waiting approach is possible.

In our study medical treatments with nifedipine and tamsulosin proved to be safe and effective as demonstrated by the low incidence of side effects and the increased stone expulsion rate. Moreover, medical therapy, particularly tamsulosin, seems better regarding stone expulsion rate and time.

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# FRACTURE PENIS: WHAT SURGERY CAN DO?

MS ALAM, MSA CHOWDHURY, M M ISLAM, SN NAG, AKMZI BHUIYAN

## Abstract

*Introduction: The purpose of this retrospective study was to review the effect of early surgical exploration and repair of penile fractures.*

*Methods: The participants were 16 patients with a fractured penile shaft following blunt trauma to the erect penis. Data were gathered over a period of 36 months. All patients were treated by surgical repair.*

*Results: Associated urethral injuries were found in 3 out of the 16 patients (18.75%). These patients had bleeding from the urethra at presentation. Seven patients had tears in the tunica albuginea only; the 9 remaining patients also had disruption of the corpus cavernosum. All tears involved the distal two-thirds of the penile shaft. All patients reported normal psychogenic, reflexogenic, and nocturnal erections with full sexual activity at 3-month and 6-month evaluations after surgery. Results of pharmacocavernosometric testing showed that all patients had rigid erections that occurred within 3-10 minutes and lasted for more than 30 minutes.*

*Conclusion: Early surgical exploration and repair of penile fractures gives successful healing of tunical breach, early return to full sexual activity and alleviates risk of venous leak and thereby minimize the incidence of erectile dysfunction as a long-term complication.*

## Introduction

The erect penis is very vulnerable to fracture through tunica albuginea<sup>1-4</sup>, which may be sustained during sexual intercourse or through vigorous manipulations during masturbation or other violent sexual activities<sup>3</sup>. The diagnosis is usually evident from the history of the specific incident as well as finding of egg plant deformity on physical examination<sup>2</sup>. Patients usually hear a loud cracking noise at the moment of the injury<sup>4</sup>.

Ruckle et al<sup>5</sup> found that 20% of patients with a fractured penis had urethral injury. In other reports<sup>6,7</sup>, the incidence of associated urethral injury ranged from 14% to 33%. Retrograde urethrography is mandatory in cases with urethral bleeding at the time of presentation.

Long-term consequences of such trauma include erectile dysfunction<sup>6-8</sup>. The aim of the present retrospective study was to review the effect of early surgical exploration

and repair on the overall healing of these injuries and to determine the maintenance of erectile function.

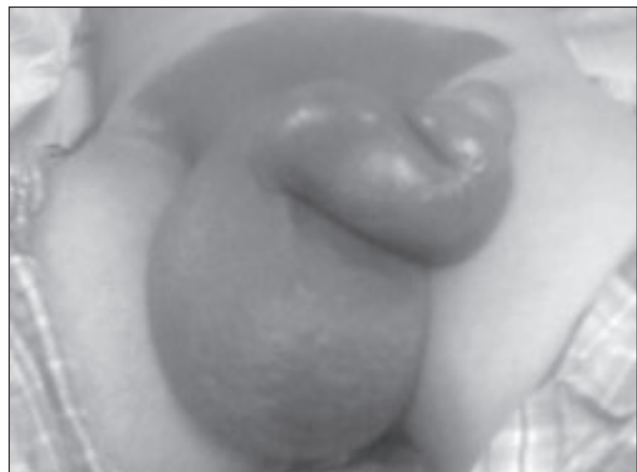
## Methods

The participants were 16 patients with a mean age of 32 years (range, 18-54 years). The patients presented with a fractured penile shaft following blunt trauma to the erect penis. Data were gathered over a period of 36 months. On admission, 15 patients gave a clear history of having blunt trauma to the erect penis; 9 injuries occurred during intercourse and 6 injuries occurred during vigorous penile manipulations. The remaining one patient claimed to have discovered swelling and discoloration of his penis upon awakening in the morning. He denied any history of trauma. Of the 16 patients, 7 heard a snapping sound, 6 heard a crack, and the remaining 3 did not hear any sound at the time of injury.

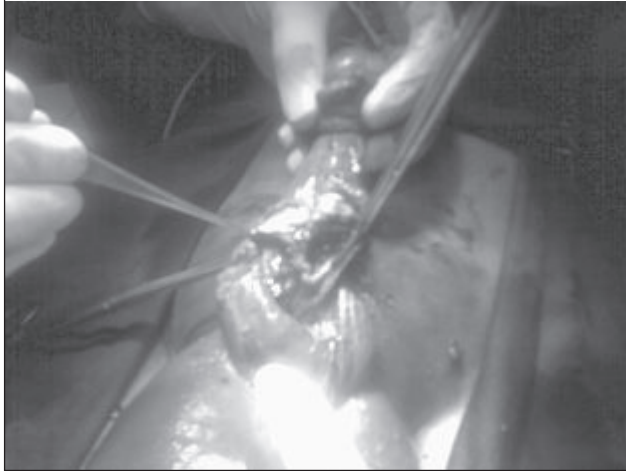
## Procedures

All cases were initially managed with analgesics and cold fomentations to control the pain and progression of the local hematoma. Antibiotics were given to prevent infection.

Retrograde urethrography was done in all cases where perurethral bleeding was found, under strict aseptic precautions to reveal any associated urethral injuries prior to exploration.



*Fracture penis and extravasation of urine*



*Fracture in tunica albuginea and rupture urethra*



*Repair*



*After surgery*

The surgeons performed a circumferential subcoronal incision and degloved the penile skin. They then evacuated the hematoma, identified any local tears in the tunica albuginea and corpus cavernosum, and explored any associated urethral injury.

Associated urethral injuries were repaired over a catheter with the synthetic absorbable material polyglactin 910 (Vicryl 5/0). The tunical-corporal tear was closed with nonabsorbable polypropylene (Prolene 4/0;). The tear

was stitched with inverted knots to avoid irritation to the patient's future erections. The skin was closed with absorbable material (Vicryl 4/0) without drains.

Postoperatively, antibiotics were continued for 5 days. Analgesics were prescribed as needed. The urethral catheter was removed after 2-3 days if there was no urethral injury and after 7-10 days if injury was present.

All patients were seen at the outpatient department after 2 weeks to review the wound. Subsequent evaluations were done at 3 and 6 months.

### Results

Concomitant urethral injuries were found in 3 of the 16 patients. Seven patients had tears in the tunica albuginea only; the 9 remaining patients also had disruption of the corpus cavernosum.

The average hospital stay was 5 days. When reviewed at the outpatient clinic after 2 weeks, the skin wounds of all patients was healed well; only 2 patients showed minimal residual swelling. There was no incidence of wound infection.

All patients reported normal psychogenic, reflexogenic, and nocturnal erections with full sexual activity at the 3-month and 6-month evaluations after surgery. Results of pharmacocavernosometric testing showed that all patients had rigid erections that occurred within 3-10 minutes and lasted for more than 30 minutes.

### Discussion

Fractures may occur in the erect penis as a result of sexual intercourse or vigorous manipulation during masturbation or other violent activities<sup>3,4</sup>. The fractures may result in the rupture of the corpora cavernosa by blunt trauma that may occur during sexual intercourse, when the corpus is impacted against the pubic bone of the partner<sup>10</sup>. Accidents such as rolling out of bed and striking a wall, hitting a toilet seat, being thrown against the knob of a saddle, rolling out of a chair onto the floor, or trying to put the erect penis into the pants may also result in a direct trauma<sup>11</sup>.

In the present study, 60% of the patients reported that the fractured penis occurred during sexual intercourse and 40% of the patients gave a history of vigorous penile manipulations. Diagnosis was established from the history and physical examination. In other reports, penile fracture was diagnosed by physical examination and occasionally confirmed by cavernosography<sup>12</sup>.

The classic pathological injury to the erect penis is tunical rupture which is usually transverse and most commonly

involves the distal third of the penis<sup>11</sup>. In the present study, the tunical rupture involved the distal-two thirds of the penis.

Associated urethral injuries were found in 3 (18.75%) of the 16 patients. Ruckle and his colleagues<sup>5</sup> found urethral injury in 20% of patients with fracture penis. In other reports<sup>12,13</sup>, the incidence of associated urethral injury ranged from 14% to 33%.

Blunt trauma to the erect penis leads to a short-term marked increase in the intracavernous pressure that approximates or exceeds the tunical tensile strength<sup>11,12</sup>. These suprphysiological pressures result from the redistribution of corporeal blood to the nonloaded portions of the erect penile shaft. Such pressure elevations cause a spectrum of injuries to the tunica albuginea and the intracavernous vasculature. They resulted in midshaft cavernous artery occlusion in 28% of the patients studied by Penson et al<sup>13</sup>. These injuries, when treated promptly with immediate surgical exploration and repair, usually heal well without any long-term consequences such as erectile dysfunction<sup>11,14-19</sup>.

In the present study, management of penile fracture included subcoronal circumferential incision and immediate repair of the tunical rupture with evacuation of any hematoma or associated intracavernous bleeding. Although some surgeons advocate the use of an upper scrotal incision with eversion of the penile skin, the present authors found that the circumferential subcoronal incision with degloving of the penis was very satisfactory. It provided excellent exposure of the site of the injury, the urethra, and both corporal bodies.

Conservative management of penile fractures has been used by some authors. However, 10% to 53% of the patients reported long-term complications of shaft deformity, suboptimal erections, and/or difficulty with coitus<sup>16</sup>. Moreover, the results of follow-up cavernosometric testing were abnormal in these patients<sup>11</sup>. The clinical results and normal pharmacocavernosometric values in the present patients indicate that the fractured penis is best treated by early surgical exploration and repair. Surgery is a safe and effective way to restore erectile function that is satisfactory for all patients and their partners. These encouraging results and the results of previous studies<sup>20-22</sup> suggest that surgical intervention is strongly recommended.

### Conclusion

Early surgical exploration and repair of penile fractures gives successful healing of tunical breach, early return

to full sexual activity and alleviates risk of venous leak and thereby minimize the incidence of erectile dysfunction as a long-term complication.

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# A COMPARATIVE STUDY BETWEEN TRANS-RECTAL ULTRASOUND GUIDED 6-CORE AND 12- CORE PROSTATE BIOPSY FOR DETECTION OF PROSTATE CANCER

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## **Abstract:**

**Purpose-** This study was performed to assess the comparative accuracy of trans-rectal ultrasound guided 6-core versus 12-core prostate biopsy for detection of prostate cancer.

**Materials and Methods:** A prospective comparative study between 6 cores and 12 cores prostate biopsy was done by a prospective comparative study from July 2007 to June 2008 in urology outpatient department, Bangabandhu Sheikh Mujib Medical University, Dhaka Medical College Hospital, Popular diagnostic Centre, Dhaka and Comfort Nursing Home, Dhaka. Study population included the patients having raised serum PSA or abnormal DRE attending in the above centres. They were divided into two groups. Group A was scheduled for 6 cores biopsy and Group B for 12 cores biopsy. A total 60 patients of PSA >4ng/ml or abnormal DRE or both were selected for prostate biopsy.

**Results:** In this study prostate cancer detection rate in 6 core prostate biopsy (Group-A) was 20% and in 12 core prostate biopsy (Group-B) was 46.67%. This study showed significant difference between the two procedures in respect of cancer detection. The 12 cores TRUS-guided prostate biopsy improved the detection rate of prostate cancer by 26.67% when compared with the traditional 6 cores biopsy technique without increasing in the morbidity.

**Conclusions:** The results of this study shown that the cancer detection rate is higher in transrectal ultrasound guided 12 cores prostate biopsy than transrectal ultrasound guided 6 cores prostate biopsy without increasing the morbidity.

**Key words:** Trans-rectal ultrasound, core prostate biopsy

## **Introduction:**

Prostate cancer is the most common cancer and the second most common cause of cancer-related death in men in the United States. The probability of developing

prostate cancer in men under the age of 40 years is 1 in 10,000 and for men of 60-79 years it is 1 in 8 cases<sup>1</sup>. Diagnosis of prostate cancer requires obtaining cancerous tissue from the prostate gland during biopsy. The standard of reference for diagnosis of cancer of the prostate is by transrectal sonographically guided needle biopsy<sup>2</sup>.

Digital rectal examination (DRE) of the prostate has long been the sole method of physically examining the prostate. Nodularity, hardness, or irregularity on DRE has led to the clinician to perform biopsy of the prostate to determine the presence or absence of carcinoma. Before the era of 6 core biopsy, the diagnosis of prostate cancer relied on three methods: DRE, needle biopsy, and open perineal biopsy. The need for a tissue diagnosis led to the first documented needle biopsy technique of the prostate was transperineal needle aspiration. The major advancement in prostate needle biopsy was the use of transrectal ultra-sonography (TRUS). Digitally guided biopsy missed more than 50% of adenocarcinomas compared with TRUS guided biopsy<sup>3</sup>.

The modern era of prostate biopsy began with the use of TRUS guided biopsy in a directed versus a random systematic manner. The technique was to direct the biopsy needle to a total of 6 anatomic sites bilaterally—the apex, middle, and base of each side of prostate parasagittally—in addition to any hypoechoic regions noted on TRUS guided. This technique has become the reference of standard and this technique is called the systematic 6 core (sextant) prostate biopsy technique. Noting that a significant volume of prostate was not sampled using the 6 core technique; several studies were designed to investigate the role of more than 6 biopsy core. Believing that 6-biopsy core is inadequate for sufficient sampling of the prostate, Levine et al (1998) sampled the prostates of 137 men with abnormal DRE findings or an elevated PSA level with

two independent consecutive sets of 6 core biopsy. Their protocol noted a 30% increased cancer detection rate after two consecutive sets compared with a single set of 6 core biopsy in the same patients<sup>4</sup>.

With the understanding that 6 core biopsy technique does not sample the lateral peripheral zone tissue, Presti et al (2004) enrolled 483 patients with either abnormal DRE findings or a PSA level of 4.0 ng/mL or greater for peripheral zone tissue in their samples, they added four additional biopsy locations to the standard 6 core technique, two biopsy sites at the lateral position bilaterally<sup>1</sup>. Analysis of the cancer detection rate from each site noted that 6 core biopsy techniques missed 20% of cancers<sup>3</sup>.

In clinical stage T2 carcinomas and in 85% of non-palpable tumors diagnosed on needle biopsy (stage T1c), the major tumor mass is peripheral in location. In the remaining cases, tumors are predominantly located in the transition zone (i.e., periurethrally or anteriorly). Tumors that appear to be unilateral on rectal examination are bilateral in approximately 70% of cases when examined pathologically. Adenocarcinoma of the prostate is multi-focal in more than 85% of cases<sup>5</sup>. The optimal number of biopsy core needed to detect prostate cancer remains controversial. Many investigators have insisted that large number of biopsy core should be obtained. In another study reported cancer detection rate of 26% and 27% in 6 cores and 12 cores prostate biopsy respectively. Some recent studies have suggested that the standard 6 core biopsy (B<sub>x</sub>6C) lacks sensitivity. Besides prospective studies have demonstrated that the addition of lateral cores to the (B<sub>x</sub>6C) significantly increases detection rate of prostate cancer<sup>6, 7</sup>.

Higher tumor volume is located in the peripheral zone more lateral to the Bx6C plane. Based on this, Eskew et al (1996) were the first to perform biopsies with more lateral core<sup>8</sup>. Extended multisite directed biopsy (extended biopsy) scheme increases early cancer detection compared with 6 core prostate biopsy<sup>9</sup>.

Prostate cancer is not uncommon in Bangladesh. Exact prevalence of prostate cancer is not known in our country. The present study is designed to compare the effectively of 6 cores and 12 core prostate biopsy for detection of prostate cancer in Bangladeshi men.

#### **Materials and Methods:**

This is a hospital based prospective comparative study conducted between July'2007 to June'2008 in the

Urology department, Bangabandhu Sheikh Mujib Medical University, Dhaka Medical College Hospital, Popular diagnostic Centre and Comfort Nursing Home. Study population included by random sampling. Patients were included according to selection and exclusion criteria with a target to recruit finally not less than 30 cases in each group. Group A was scheduled for 6 cores biopsy and Group B was scheduled for 12 cores prostate biopsy.

Patients with hard consistency or nodularity of prostate in DRE and raised serum PSA > 4 ng/ml were included and patient with bleeding disorder, patient with anorectal pathology, presence of active UTI or prostatitis were excluded from the study.

All male patients aged over 50 years having lower urinary tract symptoms (LUTS) attending to Urology OPD were evaluated and potential participants were counseled for prostate biopsy. Informed consent was taken. Before taking biopsy patients were again judged by selection and exclusion criteria.

Patients were prepared by bowel cleansing, prophylactic antibiotics and withdrawing anticoagulant if any. Patients were grouped into A and B. Group A patients were submitted for TRUS guided 6 cores prostate biopsy and Group B patients were submitted for TRUS guided 12 cores prostate biopsy. Then biopsy was taken as per following procedure.

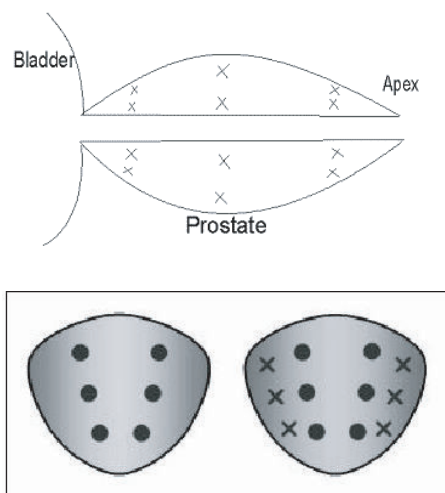
#### **Biopsy Procedure:**

Oral fluoroquinolone (Ciprofloxacin) and metronidazole were given at least 2 hours before the procedure and continued for at least 5 days after prostate biopsy. The buttock was flush at the margin of the table to allow easy manipulation of the probe and biopsy gun without obstruction. Enrolled, consented, and prepared patient was positioned in left lateral decubitus on sonography bed and hip flexed at 90° degree. Painting and rectal swabbing was done by using povidone iodine. First DRE was done with well lubricated gloved finger. Then TRUS is done by endorectal ultrasound probe covered by condom. Lubrication was liberal. Compatible needle guide and additional condom were applied to cover TRUS probe and needle guide. Biopsy cores were taken by Monopty gun. TRUS image was superimposed with a trajectory corresponding to the anticipated needle path. The Monopty gun advanced the needle 0.5 cm and sampled the subsequent 2.2 cm of tissue with the tip extending 0.5 cm beyond the area was sampled. Therefore, when sampling the PZ, the needle tip was

placed 0.5 cm posterior to the prostate capsule before firing. Similarly when sampling anteriorly, the needle tip was placed not less than 2.5 cm from the anterior venous plexus before firing to avoid hematoma formation. For Group A patient biopsies were obtained from 6 anatomic sites—the apex, middle, and base of each lobe, parasagittally bilaterally. For Group B patient biopsies were obtained from 12 anatomic sites; 6 sites of 6-core biopsy and 6 additional lateral biopsies in same level. Tissue was preserved in 10% formalin and was sent for histopathology. Routine tissue processing and staining was done. Patients were observed for 2 hours and discharged with cell/phone number so that they could contact for any problems. Patients were advised to come for a follow up with histopathology report and an interview with leading questions on morbidity was taken. Patients were asked to take prescribed antibiotics for 5 days.

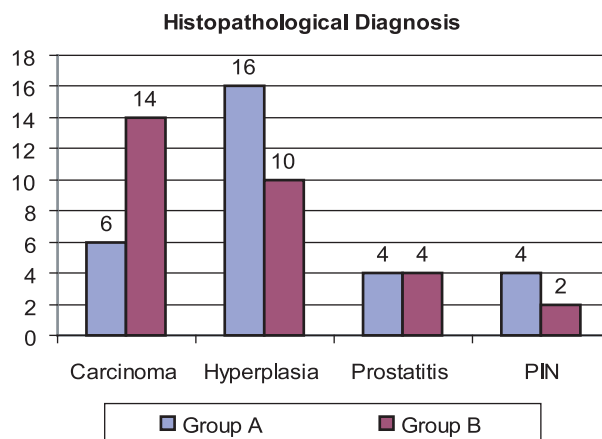
Data were collected from history, findings of clinical examination, results of investigations before prostate biopsy, during observations, and at the time of follow up with histopathology report leading questions were asked about morbidity. Data collection sheet containing the selected points were filled up. After meticulous checking and rechecking data compilation and statistical analysis (Chi square test, Student's unpaired 't' test) were done using computer, based on statistical software (SPSS-12) and necessary help was taken from the resource personnel in the field of statistics. A 'p' value < 0.05 was considered as significant.

**Observations and Results:**



**Fig.-1:** Sites of taking biopsy from prostate (Biopsy sites of 6 & 12 core)<sup>10</sup>

The age distribution of Group-A was 52 to 78 years and Group-B was from 51 to 82 years. The mean age of group-A and Group-B were 65.33 and 67.77 years respectively and SD of age of group-A and Group-B were 15.98 and 24.31 respectively. There was no significant age difference between two groups (Fig.-2).



**Fig.-2:** Proportional Bar diagram of Age Distribution of Patients:

Volume range was 33-64.5 gram for Group A and 32-63 gram for Group B. For Group A mean volume was 47.78 gram and for Group B it was 47.07 gram SD was 8.91 for Group A and 8.95 for Group B. There is no significant difference of volume of prostate between the two groups. (At df = 58 't' value was 0.31, p > 0.05).

Serum PSA level was measured in all patients. PSA level was 3.5-21.5 ng/ml for Group A and 3.8- 19.5 ng/ml for Group B. For Group A mean PSA level was 8.7 ng/ml and for Group B it was 9.28 ng/ml and SD was 3.73 for Group A and 4.55 for Group B. There is no significant difference of PSA level between the two groups (at df = 58't' value was 0.54, p > 0.05).

Per-rectal digital examination was done in all patients. In Group A 24 (80%) patients were found normal DRE finding other than enlarged prostate and 6 (20%) patients were seen abnormal DRE finding, e.g. hard consistency or nodule in prostate. Similarly in Group B 23 (76.67%) patients were found normal DRE finding other than enlarged prostate and 7 (23.33%) patients were seen abnormal DRE finding, e.g. hard consistency or nodule in prostate. With +2 test at df 1 and in 5% significant level +2 value from table is 3.84 which is greater than calculated value (0.98). So DRE finding is not significant in between two groups (p > 0.05).

**Table-I**  
*Post procedural fever, dysuria, sepsis, hematuria and per rectal bleeding*

Group	Fever	Dysuria	Sepsis	Hematuria	Per rectal Bleeding
A (n=30)	2 (6.67%)	6(20%)	0(0%)	18 (60%)	4 (13.33%)
B (n=30)	3 (10%)	14 (46.47 %)	0(0%)	21 (70%)	6 (20%)

**Table-II**  
*Comparison of efficacy of two procedures:*

Group	Carcinoma	Non-malignancy	df	$\chi^2$	p value	Inference
A (n=30)	6	24	1	4.563	<0.05	S
B (n=30)	14	16				

$\chi^2$  test = Chi square test

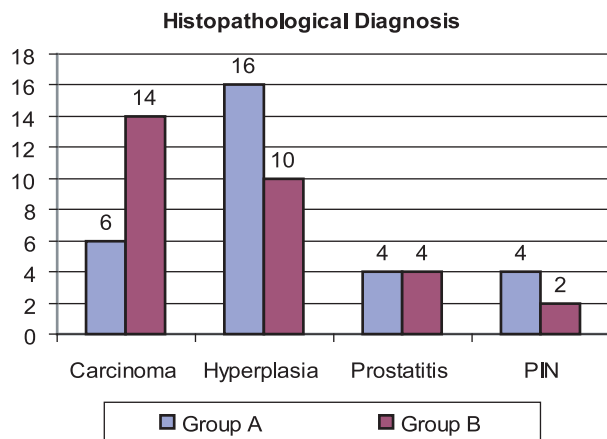
df = degree of freedom

S = significant

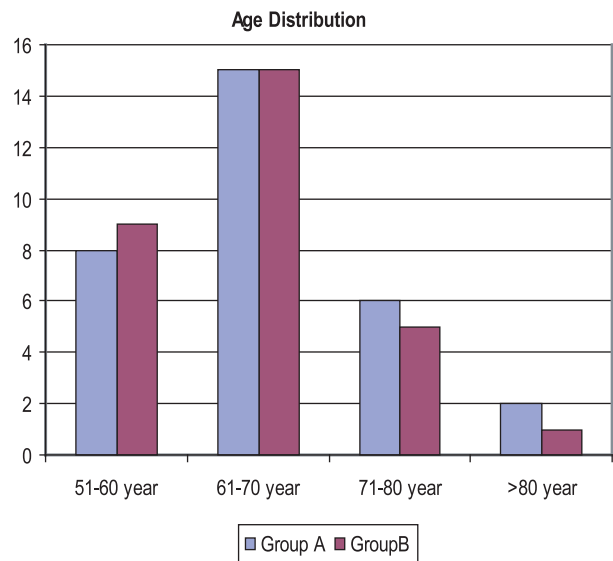
In Group A 2 (6.67%) patients developed fever (temperature > 100 °F) and in group B 3 (10%) developed fever up to the follow up period of 72 hours. In Group A 6 (20%) patients developed dysuria and in Group B 14 (46.47%) complained of dysuria after 72 hours follow up. In Group A 18 (60%) patients complained of macroscopic hematuria and in Group B 21 (70%) complained of macroscopic hematuria after 2 hours of prostate biopsy. In Group A, 4 (13.33%) patients continued per rectal bleeding and in Group B, 6 (20%) complained per rectal bleeding after 2 hours of prostate biopsy (Table-I).

All histopathology reports were collected. For Group A carcinoma prostate was diagnosed in 6 (20%) patients and for Group B it was diagnosed in 14 (46.67%) patients. Benign prostatic hyperplasia was diagnosed

in 16 (53.33%) patients in Group A and 10 (33.33%) patients in Group B. Prostatitis were diagnosed in 4 (13.33%) patients in each Group. Prostatic intraepithelial neoplasia (PIN) was diagnosed in 4 (13.33%) patients in Group A and 2 (6.67%) patients in Group B (Figure-3).



**Fig 2: Proportional Bar diagram of Age Distribution of Patients:**



**Fig.-3: Histopathological diagnosis**

In Group A 6 cases were diagnosed as carcinoma prostate and 24 cases were diagnosed as other diseases. In Group B 14 cases were diagnosed as carcinoma prostate and 16 cases were diagnosed as other diseases (Table-II). With  $\chi^2$  test at df 1 and in 5% significant level  $\chi^2$  value from table is 3.84 which is smaller than calculated value (4.563). So the result is statistically significant ( $p < 0.05$ ).

**Discussion:**

Prostate biopsy has become a common office procedure for urologists for a number of years. However, this procedure has changed significantly in recent years due to advances in equipment and continuous efforts to improve the sensitivity of the procedure. Transrectal ultrasound (TRUS)-guided systematic needle biopsy is the most reliable method at present of sampling prostatic tissue. Prostate biopsy is considered in men at high risk for harboring prostate cancer based on DRE and PSA findings. The major role of TRUS is to ensure accurate wide-area sampling of prostatic tissue<sup>11, 12</sup>. The optimal biopsy technique in terms of the number of biopsies and the needle placement for tissue procurement that minimizes the chance of missing a relevant cancer is controversial.

The sextant technique is inaccurate mainly because it under-samples the peripheral zone of the prostate. In modified sextant biopsy from peripheral zone appears to improve the cancer detection rate. Extended biopsy techniques that utilize additional cores directed to the peripheral zone also have improved prostate cancer detection rather than 6 cores. Taking 10 to 12 tissue cores has become the standard of biopsy<sup>2</sup>.

This study compared the detection rate of prostate cancer and post procedural morbidity between 6 core prostate biopsy and 12 cores prostate biopsy. Present study was conducted in similar background of age, prostate volume, DRE findings and PSA value. Group A patients underwent TRUS guided 6 core prostate biopsy and Group B patients underwent TRUS guided for 12 core prostate biopsy. In this study age limit of patients was 52-78 years for Group A and 51-82 years for Group B. Mean age was 65.33 years for Group A and 65.77 years for Group B. Similar study was conducted by different investigators. Age limit was similar as prostate cancer is more prevalent after 60 years of age; e.g. study of Kim et al (2004) mean age was 63.83 years for 6 core and 62 years for 12 core group respectively<sup>10</sup>.

Serum PSA was measured for all patients before prostate biopsy. In this study PSA range was 3.5 -21.5 ng/ml for Group A and 3.8-19.5 ng/ml for Group B with mean PSA was 8.7 ng/ml for Group A and 9.28 ng/ml for Group B. In Group A, 3 patients had PSA level < 4 ng/ml and in Group B, 2 patients had PSA level < 4 ng/ml. They were included in this study due to suspicious DRE finding (e.g. hard prostate or nodule in prostate). During first evaluation volume of prostate was measured by USG. In this study volume range of prostate was 33-64.5 gram

for Group A and 32-63 gram for Group B. Mean volume was 47.78 gram for Group A and 47.07 gram for Group B patients. Per-rectal digital examination was done in all patients. In Group A, 24 (80%) patients were found normal DRE finding other than enlarged prostate and 6 (20%) patients were seen abnormal DRE finding, e.g. hard consistency or nodule in prostate. Similarly in Group B, 23 (76.67%) patients were found normal DRE finding other than enlarged prostate and 7 (23.33%) patients were seen abnormal DRE finding, e.g. hard consistency or nodule in prostate. Most of the patients in this study underwent prostate biopsy is due to raised PSA level.

In current study carcinoma prostate was diagnosed in 6 (20%) patients in Group A and 14 (46.67%) patients in Group B. Benign prostatic hyperplasia was diagnosed in 16(53.33%) patients in Group A and 10 (33.33%) patients in group B. Prostatitis was diagnosed in 4 (13.33%) patients in both group. Prostatic intraepithelial neoplasia (PIN) was diagnosed in 4 (13.33%) patients in group A and 2 (6.67%) patients in group B. In this study cancer detection was 20% for 6 core prostate biopsy (Group A). Result is similar to the study of Mariappon et al, (2004), (i.e. 17%)<sup>13</sup>. In this study cancer detection was 46.67% for 12 core prostate biopsy (Group B). Cancer detection rate was significantly higher in Group B than Group A. Result was similar to the other studies of multiple core prostate biopsies, more than 10 cores (Mariappon et al, 2004). Result was different from the study of Kim et al (2004). Study of Kim et al was conducted in Korea which was a geographical area of low incidence of prostate cancer. Other reasons might be they took sextant biopsy from more peripheral zone and had larger sample size. That study showed cancer detection was 27% for 6 core prostate biopsy and cancer detection was 26% for 12 cores prostate biopsy<sup>10</sup>.

In 2004 Naya with co-investigators performed an extended biopsy of prostate and found increased cancer detection rate<sup>9</sup>. In a study conducted by Mariappon et al (2004) showed that increasing core increase cancer detection rate over 6 core biopsy. Presti et al (2000) reported a significant increase of prostate cancer detection rate with increasing biopsy core<sup>14</sup>. In 2003 Matalga, Eskew and McCullough showed in a review article that increasing biopsy core increases cancer detection rate, especially when biopsy was taken from more peripheral zone. Levine et al compared 6 and 12 core prostate biopsy by a consecutive 6 and 12 cores

prostate biopsy. Their result showed a 28% increase in cancer detection rate over standard sextant biopsy. This result was statistically significant and similar to present study (26.67%)<sup>4</sup>. The study of Presti et al (2000) detected 42% had prostate cancer. Present study showed a 33.33% patient had prostate cancer<sup>14</sup>.

Presti et al (2000) revealed that traditional sextant biopsy missed 20% of prostate cancer<sup>4</sup>. Present study showed that 6 core prostate biopsy missed 26.67% of prostate cancer. Similar findings were found in another review article by Silletti et al (2007). They reported a 30% improvement in prostate cancer detection rate when 10 core or more biopsy were taken and extra biopsy cores were taken from peripheral zone<sup>3</sup>. Findings were similar to present study. In order to improve the sensitivity of the biopsy, Stamey et al (1999) suggested that the sextant biopsy should be performed slightly more laterally based on cancer mapping of radical prostatectomy specimens (75% of prostate cancer originates from the peripheral zone)<sup>14, 15</sup>. Chang et al added 4 lateral regions in addition to the sextant biopsy. This revealed that lateral region biopsies found an additional 14% of positive cancer biopsies not diagnosed with regular sextant biopsy<sup>12</sup>.

The ability of the standard 6- core biopsy to provide optimal sampling was questioned by recent studies. Uzzo et al (1999) reported on cancer detection rates and their variation with prostate size using a systematic sextant core biopsy regimen. Using a sextant regimen, the cancer detection in glands > 50 g was 23% vs. the cancer detection is 38% in glands < 50 g. Their data suggest that significant sampling error may occur in men with large glands, and more biopsies may be needed under these circumstances. Karakiewicz et al (1999) also evaluated the positive rate of sextant biopsy according to gland size. The positive biopsy rate for glands less than 20 cc was 40% vs. 10% for glands 80-90 cc. Levine et al (2001) also contributed to the evidence of increased sampling error in larger glands<sup>11</sup>.

They also concluded that biopsy sensitivity did not surpass the sextant biopsy when the regions of the biopsy were not different<sup>16</sup>. The addition of lateral cores added tumors to the sextant biopsy in up to 35% of the cases<sup>3</sup>. In a review study by Matlaga et al (2003) reported the cancer detection rates were 27.6 % (42/152) and 19.7 % (30/152) for the 10-core and 6 core biopsy protocols respectively<sup>4</sup>. Adding the lateral peripheral zone (PZ) to the 6 core biopsy showed a 28.6 % (12/42) increase in the cancer detection rate in patients with positive prostate cancer without increase in the morbidity<sup>3</sup>. Yamamoto et al Presti et al, 2000 performed biopsy the prostate of 237 patients in the sextant group;

prostate cancer was detected in 47 patients (19.8%)<sup>17</sup>. The cancer detection rate, morbidity and complications were similar to present study.

Post procedural morbidity was evaluated and compared in between two groups. In Group A, 2 (6.67%) patients developed fever (temperature > 100° F) and in Group B, 3 (10%) developed fever up to the follow up period of 72 hours. This difference was not significant in between two groups. In Group A, 6 (20%) patients complained dysuria and in Group B, 14 (46.47%) complained dysuria and voiding difficulty after 72 hours follow up. This difference was significant in between two groups but comments can not be drawn with this small study. In Group A, 18 (60%) patients complained naked eye hematuria and in Group B, 21 (70 %) complained naked eye hematuria after 2 hours of prostate biopsy. Similarly 4 (12.33%) patients in Group A complained per rectal bleeding and in Group B, 6 (70 %) patients complained per rectal bleeding after 2 hours of prostate biopsy. These differences were not significant in between two groups.

By reviewing data of previous studies in Japan the Japanese Urological Association showed the rate of rectal bleeding was 5.9%, which was only encountered after transrectal biopsy. Fever (38°C) and sepsis were observed in 1.1% and 0.07%, respectively. Voiding difficulty and urinary retention occurred in 1.9% and 1.2% of cases, respectively. Type and rate of complications were similar to present study and were negligible<sup>18</sup>.

In another comparative study between 6 core and 12 core prostate biopsy Djavan et al (2001) showed rectal bleeding (2.1% versus 2.4%), mild hematuria (62% versus 57%), severe hematuria (0.7% versus 0.5%) and vasovagal episodes (2.8% versus 1.4%, respectively). Major complications were rare and included urosepsis (0.1% versus 0%) and rectal bleeding that required intervention (0% versus 0.1%, respectively)<sup>19</sup>. This result is similar to present study. In another study Ghani, Dundas, Patel (2004) showed the prevalence of bleeding complications (6, 8- and 12-core, respectively) was: hematuria 44%, 41% and 39%; haemospermia 13%, 16% and 12%; and rectal bleeding 17%, 26% and 27%. Naughton et al, (2000) showed there was no difference of post-biopsy pain between the 6 and 12-core groups. In the 12-core group there was an increase in hemochezia and hemo spermia (24% versus 10% and 89% versus 71% respectively) but no significant difference between groups reporting morbidity as a major problem. These results of morbidity were negligible and comparable to the results of current study<sup>20</sup>.

There were some limitations in this study as- sample size was small ; consideration of subdivision of prostate volume were not taken like < 40g, 40-60g, >60g ;

consideration of subdivision of PSA value were not taken like < 4ng/ml, 4-10ng/ml, >10ng/ml ; prostate biopsy was performed by different urologists ; histopathology was done by different pathologists. With al, these limitations it was concluded that 12 core prostate biopsy is preferable to 6 core prostate biopsy in diagnosis of prostate cancer.

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# PERCUTANEOUS NEPHROLITHOTOMY WITH MULTIPLE TRACTS: COMPARISON OF MORBIDITY WITH SINGLE-TRACT PROCEDURE

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## Abstract

**Objective:** To find out a method of percutaneous nephrolithotomy (PCNL) that can achieve greater stone clearance with acceptable morbidity.

**Patients and Methods:** From January 2007 to May 2008, seventy patients were studied prospectively in two institutions and two other hospitals in Dhaka city for their complex renal stone management by percutaneous nephrolithotomy either with single tract or with multiple tract procedures. On the basis of assessment of calculus configuration and collecting system anatomy, patients who were managed with single tract PCNL labeled as Group A and those with multi-tract PCNL as Group B. Per-operative and post-operative events of all cases were analyzed for overall stone clearance, duration of operation time, per operative blood loss, post operative duration of haematuria, fever and analgesia requirement, urinary leakage through the nephrostomy tract, renal function and post operative hospital stay.

**Results:** The mean stone size in Group A was 4.4 (range 3.3- 6.9) cm and 5.8 (range 4.1- 8.8) cm in Group B ( $p < 0.05$ ). Stone clearance in group A was 82.0% ( $n=39$ ) and in group B was 87.0% ( $n=31$ ). The mean operative time (min) of group A and B were  $97.0 \pm 3.9$  and  $124.0 \pm 2.7$  respectively ( $p < 0.05$ ). Mean blood loss was  $347 \pm 18.7$  ml and  $424 \pm 42.7$  ml with single and multiple tract group respectively ( $P < 0.05$ ). Blood transfusion needed in 25.8% patients of multiple tract group and 12.8% patients of single tract group ( $p > 0.05$ ). Among the post-operative outcomes, fever occurred in group A was 17.9% ( $n=7$ ) and in group B was 16.2% ( $n=5$ ). Analgesia requirement was higher in Group B (mean  $187.50 \pm 14.00$  mg) than in Group A (mean  $194.17 \pm 15.71$  mg) ( $p > 0.05$ ). The mean haematuria (in days) occurred in group A was  $1.97 \pm 0.93$  and in group B was  $2.23 \pm 0.92$  ( $p > 0.05$ ). Urine leakage stopped earlier in group-A ( $24.79 \pm 4.15$  hours) than that in Group-B ( $26.73 \pm 4.04$  hours) ( $p > 0.05$ ). The mean serum creatinine (mg/dL) levels

preoperatively was  $1.14 \pm 0.40$  and  $1.58 \pm 0.98$ ; postoperatively was  $1.24 \pm 0.58$  and  $1.91 \pm 1.64$  in group A and group B respectively ( $p < 0.05$ ). Mean hospital stay in days was  $3.05 \pm 0.17$  (range 7-2 days) and  $4.12 \pm 0.15$  (range 11-2 days) in group A and group B respectively ( $p < 0.05$ ). During procedure, No conversion to open surgery was needed in either group. In two patients, one from each group, the procedure had to be deferred due to excessive bleeding and managed conservatively keeping nephrostomy tube followed by second look PCNL.

**Conclusion:** Percutaneous nephrolithotomy with multiple tracts in a single session for treating complex stones in selected cases is safe, feasible and effective within acceptable morbidity in achieving a greater stone clearance.

**Key Words:** Percutaneous nephrolithotomy, Single Tract PCNL, Multiple Tracts PCNL, Renal calculi, Stag horn calculi, Percutaneous access point number and Location, Success rates, Complication rates.

## Introduction

Percutaneous trocar nephrostomy for hydronephrosis opened the door of a new technique done by Goodwin WE and coworkers (1955) about 50 years ago. Since then, the procedure of percutaneous nephrostomy has been refined and has vastly enriched the armamentarium of the contemporary urologist (Streem, 1996). Initially, percutaneous nephrostomy was used only for urinary diversion; subsequently it has been used for more complex procedure such as stone extraction.

The revolution of minimally invasive surgery began in 1976 when Fernström and Johansson performed the first percutaneous nephrolithotomy (PCNL). Subsequent reports on PCNL from the Mayo Clinic (Segura et al, 1982) and the University of Minnesota (Clayman et al, 1984) and from West Germany (Alken et al, 1981) and England (Wickham and Kellet, 1981) established PCNL. Further refined and advances in technique and equipment have allowed urologists to perform percutaneous stone

removal with increasing efficacy and decreasing complications (Lingeman et al, 1995). Developments in stone fragmentation, newer instruments and improved fluoroscopy have increased the versatility of percutaneous surgery. Flexible, steerable nephroscopes have allowed access to all parts of the kidney. The indications for open surgery in stone disease have thus become greatly reduced. However, in spite of all these developments, PCNL may be complicated by residual stone. Some times, complete clearance of stones may not be possible with every effort through a single percutaneous subcostal tract. They can be dealt with second look intervention through a mature nephrostomy tract. But it prolongs the hospital stay and increases the morbidity. Large stone burden also can be dealt with multiple tracts for complete clearance of stone. Therefore, in case of large stone burden with predictive chance of residual stone or when single percutaneous tract does not offer complete stone clearance, creating multiple tracts may be a useful alternative.

A concern with creating multiple percutaneous tracts is the potential for bleeding and higher complication rates compared with procedure that require a single tract. In Bangladesh, studies have been yet to done to compare the result of PCNL with single-tract versus multiple tracts. This study had been designed to focus on the outcomes in patients with multiple (>2) percutaneous access tracts with those in patients with single percutaneous access tract, and was able to compare the morbidity with specific reference to bleeding, transfusion requirements, complications, and postoperative renal function.

### Materials & Methods

This hospital based prospective interventional comparative study was done in one institute and three other hospitals between January, 2007 and May, 2008. A total of 246 patients were evaluated during the study period with renal stone. Of them 70 patients with complex renal stone were enrolled for the study according to age limit between 18 to 70 years, stone size- 3 cm. or more, complex stone and excreting Kidney. Patient with bleeding disorder, anatomic abnormality of the kidney (horseshoe kidney/ Malrotated kidney) and history of previous surgery on the proposed PCNL side were excluded. Purposive sampling was applied for this study. All cases were evaluated for stone size, location and renal function by doing the X-ray KUB, ultrasonogram of KUB and excretory urogram.

On the basis of assessment of calculus configuration and collecting system anatomy, patients who might be managed with single tract PCNL labeled as Group A and those with multi-tract PCNL labeled as Group B. Decision of access point numbers were taken by senior urologist having experience in this field. Though in 4 cases during operative procedure, decision of single tract was changed into multiple tracts according to the findings of RGP or facing difficulties to approach stones or part of it with single tract. They were grouped according to the tract number(s). No patients of preoperatively determined multitract PCNL group had to be changed into single tract group during procedure.

The system for measuring the size of the staghorn calculus was based on the measurement of the longest linear diameter in cm observed on plain X-ray KUB and stones were basically classified as simple (isolated renal pelvis, or isolated caliceal stones) and complex (Staghorn , renal pelvis stones accompanying caliceal stones). Again classification of the staghorn stones into borderline, partial and complete staghorn.

A standard technique of percutaneous nephrolithotomy was used. For calculi in the superoanterior, superoposterior, and inferoposterior calices and pelvis, the inferoposterior calyx was usually chosen for entry. Entry through the midposterior calyx was chosen for calculi in the midposterior calyx, the pelvis, and sometimes in the ureter. No supracostal puncture was done in this series. Each patient underwent PCNL beginning with cystoscopy and insertion of a ureteral catheter to allow contrast material delineation of the renal collecting system. Patients were then placed prone on the C- arm compatible operative table with all pressure points padded.

Percutaneous access was obtained at a single setting in the operating room with C-armed fluoroscopy (Siemens, Germany). With the C-arm in the vertical position, the collecting system was inspected and the appropriate calyx identified. Examination with the C-ram at 90 degrees defined the medial vertical plane for entry into the calyx. The C-arm was then rotated approximately 30 degrees toward the surgeon. This placed the axis of the C-arm in the same central posterior plane of the kidney, providing a direct end-on view of the posterior calyces. Percutaneous access was created under fluoroscopic guidance using 18 G access needle into the selected calyx with the C-arm in the 30-degree and 90-degree positions. After determination of the appropriate plane, the needle was advanced in 1 to 2cm

increments. Rotating the C-arm back to the vertical position monitored the depth of needle penetration. When the needle appeared in the selected calyx, the stylet was removed, and the correct needle position was confirmed by flow of urine. A .038-inch floppy-tipped J guide wire was inserted into the needle and either advanced across the UPJ or coiled within the renal pelvis. Access needle was removed and the skin and fascia incised. A second J tipped guide wire was introduced into the collecting systems passed through the pelvis to the ureter if possible after dilating by screw dilator, which act as a safety and other as a working guide wire. The nephrostomy tract was dilated with Alken coaxial metal dilators (Karl Storz, Germany) and a 30 F Amplatz sheath positioned into the renal collecting systems. Nephroscopy was performed with a rigid, 28 ro 26-Fr nephroscope (Karl Stortz, Germany). Fragmentation of the stone burden was accomplished using a pneumatic lithotripter (R&D Tech, India). Forceps were used to remove stone fragments. Additional tracts were created when it had become obvious that another tract was needed to get to an inaccessible calyx.

On the basis of assessment of calculus configuration and collecting system anatomy when additional tracts were indicated, all possible tracts were punctured right at the outset, and the guide wires were secured, because it is significantly easier to confirm percutaneous needle placement in an intact collecting system. Once even a single tract has been dilated, the extravasations of fluid and contrast makes confirmation of precise caliceal puncture difficult.

The access that was more likely to clear most of the stone burden was dilated first and additional accessory tracts were dilated subsequently, as required. Stone clearance and the integrity of the collecting system were confirmed intraoperatively by fluoroscopy. A 6 Fr JJ stent was placed antegradely over a safety guide wire under direct vision and was adjusted with the grasping forceps. On completion of the procedure the Amplatz sheath was removed after putting a 26 or 28-Fr nephrostomy tube into the renal pelvis or the involved calyx at the end of the procedure and compressed dressing applied. If doubt about complete clearance or bleeding from other tracts was present, additional nephrostomy tubes were placed in those tracts. If residual stone fragments were noted, a decision to proceed to a second-look nephroscopy or ESWL was taken depending on the location and size of the residue and surgeon preference.

Antibiotic prophylaxis was maintained by ceftriaxone. The first ceftriaxone dose (1 gram) was administered intravenously when anesthesia was initiated, and the dose continued until their nephrostomy tube/tubes were removed. In case of patients with post operative fever urine culture and sensitivity were done and they were treated accordingly.

On postoperative day 1, nephrostomy tube/tubes were removed if the urine was clear and if plain X-ray KUB region showed stone free or no clinically significant residual fragments. The urethral catheter was removed on postoperative day 2. The JJ stent was removed after 3 weeks. A postoperative Hb%, serum creatinine and urine culture were also obtained from each patient. The nephrostomy tube was left in place if a second PCNL session due to residual stones was planned. Re-PCNL, ureteroscopy, and shock wave lithotripsy (ESWL) were considered as accessory treatment alternatives when indicated.

After meticulous checking and rechecking data were compiled and statistical analysis were done based on statistical software (SPSS- Statistical package for social science, Version-13). A 'p' value <0.05 was considered as significant.

## Results

Attempt was made to compare the morbidity between single tract PCNL and multiple tract PCNL by duration of operative time, per operative blood loss, over all stone clearance, post operative fever and analgesia requirement, duration of haematuria, urinary leakage through the nephrostomy tract, renal function and post operative hospital stay.

246 cases of renal stone disease patients were evaluated, of them 70 patients were enrolled for study according to selection criteria.

Percutaneous nephrolithotomy was performed through subcostal puncture under general anaesthesia. After the procedure, they were grouped as Group A (Patients who were managed with single tract PCNL) and Group B (Patients requiring multi-tract PCNL). A total of 121 tracts were established in the 70 renal units. The maximal number of tracts used in a single renal unit was four (in multi-tract group range two to four). Single tracts were established in thirty nine cases, two tracts were established in sixteen patients, three tracts in ten patients and four tracts in five patients.

During procedure, No conversion to open surgery was needed in single tract group or in multi tract group. In

two patients, one from each group, the procedure had to be deferred due to excessive bleeding and managed conservatively keeping nephrostomy tube followed by second look PCNL.

Majority of the renal stones was found in the age range 39–30 years (38.5% in Group-A and 35.4 % in Group-B) and the least frequency of stones in age 60 years or above (10.2% in Group-A and 6.4% in Group-B). The mean age of Group-A and Group-B were 42.71 ± 1.95 and 41.93 ± 1.99 years respectively. Age categories were almost homogeneously distributed in both the groups (p>0.05). Majority of the subjects in both the groups (56.4% in Group-A and 61.3% in Group-B) were male(p >0.05).

The mean stone size in Group A was 4.4(range 3.3- 6.9) cm and 5.8(range 4.1- 8.8) cm in Group B. Group B had significantly larger stone (p<0.05).

Percutaneous nephrolithotomy was performed in 39(55.8%) patient with single tract and in 31 (44.2%) patients with multiple tracts. Among them 85.7% of the single tract PCNL Group had stones located in pelvis with concomitant calyces. 8.5% and 5.7% of the single tract PCNL Group had borderline staghorn and partial staghorn calculi respectively. In multi tract PCNL Group-

pelvis with associate caliceal stones, borderline and partial staghorn stones were 19.3%, 13.0% and 22.7% respectively. All complete staghorn stones (n=14) were managed by multiple tract PCNL (45.1% of Group B)

An overall success rate of 84.3% was achieved in both groups. The success rate of patients with staghorn and pelvic stone accompanying caliceal stones were 86.7% and 82.5% respectively. Patients with staghorn and pelvic stone accompanying caliceal stones had a complete stone removal rate of 53.3% and 60.0% respectively, while CIRFs were observed in 33.3% and 22.5% respectively.

Single percutaneous access was performed in 39 (55.7%) patients, while multiple (> 2) accesses were performed in 31(44.3%). Multiple accesses were necessary in 25 (83.3%) out of 30 staghorn stone, and in 6 (15.0%) out of 40 patients having pelvic stone with concomitant caliceal stones (Table-VIII). The mean size of stones treated with multiple accesses and single access tract were 5.8(4.1-8.8) cm and 4.4(3.3-6.9) cm respectively. The mean size of stone in multiple tract groups was significantly greater than those treated with single access (p < 0.05).

**Table I**  
*Location of stones and stone clearance.*

Stone category and localization	n	Stone clearance			
		Stone free n (%) (a)	CIRFn (%) (b)	successful (n %) (a+b)	unsuccessful n (%)
Complex stones	70	40 (57.1)	19 (27.2)	59(84.3)	11 (15.7)
Staghorn	30	16(53.3)	10 (33.3)	26(86.7)	4(13.3)
Borderline staghorn	7	7(100.0)	0(0)	7(100)	0(0)
Partial staghorn	9	5(55.5)	3 (33.3)	8(88.8)	1 (1.11)
Complete staghorn	14	4 (28.6)	7(50.0)	11(78.6)	3 (21.4)
Renal pelvic stone and Accompanying caliceal stones	40	24(60.0)	9 (22.5)	33(82.5)	7(17.5)

CIRF: clinically insignificant residual fragments

**Table II**  
*Success (stone-free + CIRF) rates achieved according to access point number.*

Access point number	Success rate	complex stone			Mean	Stone	Size
		Pel+ cal n (%)	Borderline n (%)	Partial n (%)			
Single access (n = 39)	34 (85.7)	3 (8.5)	2(5.7)	0(0)	4.4(3.3- 6.9)	32 (82.0)	
Multiple accesses(n = 31)	6 (19.3)	4 (13.0)	7(22.6)	14(45.1)	5.8(4.1- 8.8)	27 (87.0)	
2 accesses (n=16)	5	2	3	6	-	14 (87.5)	
3 accesses (n = 10)	1	2	2	5	-	9 (90.0)	
4 accesses (n = 5)	0	0	2	3	-	4 (80.0)	

**Table III**  
*Effects of PCNL on renal function , blood loss , transfusion and operative time .*

	Single tract n (39)	Multiple tract n(31)	Calculated value	p value
Mean serum creatinine (mg/dL)				
Preop	1.14±0.40(0.7-2.28)	1.58±0.98 (0.7-5.1)	2.35 <sup>S</sup>	<0.05
Postop	1.24±0.58	1.91±1.64	2.23 <sup>S</sup>	<0.05
Mean Hemoglobin (g/dL)				
Preop	13.4±1.9 (9.4-15.8)	11.6±2.1 (8.6-15.1)	3.72 <sup>S</sup>	<0.05
Postop	11.51±1.86	9.49±1.55	4.55 <sup>S</sup>	<0.05
Mean operative time (min)	97.0+3.9	124.0+2.7	3.41 <sup>S</sup>	<0.05
Mean blood loss (ml)	347± 18.7(180-455)	424± 42.7(320- 960)	24.7 <sup>S</sup>	<0.05
Number transfused (%)	5(12.8)	8(25.8)	1.36 <sup>NS</sup>	>0.05

t- test,  $\chi^2$  test , S= Significant , NS= Not significant

The mean operative time (min) of group A and B were 97.0+3.9 and 124.0+2.7 respectively. Significantly longer period was required in multiple tract group (p<0.05). Stone clearance in group A was 82.0 % ( n=39) and in group B was 87.0 % ( n=31).

Mean blood loss was 347±18.7 ml and 424±42.7 ml with single and multiple tract group respectively. Significant difference was found among the groups (P< 0.05). Blood transfusion needed in 8 (25.8%) patients of multiple tract group and 5 (12.8%) patients of single

tract group. This result was not statistically significant (p>0.05).

Post-operative outcomes were recorded in both groups. Post operative fever occurred in group A was 17.9 % ( n=7) and in group B was 16.2 % ( n=5). Analgesia requirement was higher in Group B (mean 187.50 ± 14.00 mg) than in Group A (mean 194.17 ± 15.71 mg). Though statistically no significant difference was found among the groups (p > 0.05).

**Table IV**  
*Comparison of outcome between group:*

Outcome variables	Group		Calculated value	p- value
	Group-A (Single tract) (n = 39)	Group-B (Multi-tracts) (n = 31)		
Stone clearance %	82.0(32)	87.0(27)	0.58 <sup>NS</sup>	>0.05
Conversion to open surgery %	0 (0)	0(0)	-	-
Per operative bleeding deferred the procedure	2.5 (1)	3.2 (1)	0.17 <sup>NS</sup>	>0.05
Bleeding necessitating blood transfusion	12.8 (5)	25.8(8)	1.36 <sup>NS</sup>	>0.05
Symptomatic urinary tract infection %		7.6 (3)	6.5 (2)	0.18 <sup>NS</sup>
>0.05				
Fever(>101° F)%	17.9(7)	16.2(5)	0.18 <sup>NS</sup>	>0.05
Haematuria (days)	1.97 ± 0.93	2.23 ± 0.92	1.17 <sup>NS</sup>	>0.05
Amount of analgesics needed (mg)	187.50 ± 14.00	194.17 ± 15.71	1.89 <sup>NS</sup>	>0.05
Urine leakage (hrs)	24.79 ± 4.15	26.73 ± 4.04	1.98 <sup>NS</sup>	>0.05
Hospital stay (days)	3.05±0.17	4.12 ± 0.15	25 <sup>S</sup>	< 0.05

t- test, S= Significant, NS= Not significant

The mean haematuria (in days) occurred during post operative period in group A was 1.97±0.93 and in group B was 2.23±0.92. No significant difference was found between the groups (p>0.05). Urine leakage stopped earlier in group-A (24.79 ± 4.15hours) than that in Group-B (26.73 ± 4.04 hours) (p>0.05). The mean serum creatinine (mg/dL) levels preoperatively was 1.14±0.40 and 1.58±0.98; postoperatively was 1.24±0.58 and 1.91±1.64 in group A and group B respectively (p<0.05). The mean Hemoglobin (g/dL) level preoperatively was 13.4±1.9 (range 9.4-15.8) and 11.6±2.1 (range 8.6-15.1), postoperatively was 11.51±1.86 and 9.49±1.55 in group A and group B respectively (p<0.05). Post operative hospital stay of the patient was also compared between the groups. Mean hospital stay in days was 3.05± 0.17(range 7-

2days) and 4.12 ± 0.15 (range 11-2days) in group A and group B respectively. Group B had higher significant difference in hospital stay than the group A (p<0.05).

Apart from hospital stay, all the outcome variables responded insignificantly in both Groups. The mean hospital stay in days was less in single tract (3.05± 0.17) group than multitract group PCNL (4.12 ± 0.15) and this difference was statistically significant as the P value was <0.05. Stone clearance in group A was 82.0 % ( n=39) and in group B was 87.0 % ( n=31). No conversion to open surgery was needed in single tract group or in multi tract group. In two patients, one from each group, the procedure had to be deferred due to excessive bleeding and their stones were cleared in a second look PCNL session.

**Table V**  
*Complications of percutaneous nephrolithotomy in 70 patients observed during follow-up.*

Complications	n (%)	Single tract n (%)	Multiple tract n (%)
Conversion to open surgery	0(0)	0(0)	0(0)
Bleeding			
Deferred the procedure	2(2.8)	1(2.5)	1(3.2)
Necessitating blood transfusion	13(18.6)	5(12.8)	8(25.8)
Hydro-hemopneumothorax	0(0.0)	0(0.0)	0(0.0)
Injury to other adjacent organs	0(0.0)	0(0.0)	0(0.0)
Perinephric abscess formation	0 (0.0)	0(0.0)	0(0.0)
Postoperative fever (>101 ° F)	12 (17.1)	7(17.9)	5(16.2)
Symptomatic urinary tract infection	5 (7.1)	3(7.6)	2(6.5)
Hematuria >24 h	8(14.4)	5(12.8)	3(9.6)
Prolonged urine leakage from tract(s)	3 (4.3)	1(2.5)	2(6.4)

**Table VI**  
*Summery of comparison of base line variables among the present study and some other studies.*

	Present Study		Hegarty et al, 2006		Netto et al,2005		Muslumangolu et al, 2006	
	Single tract	Multiple tract	Single tract	Multiple tract	Single tract	Multiple tract	Single tract	Multiple tract
Mean age	42.71±1.95	41.93± 1.99	54.4±12.4	59.4±15.5	42.7	45.6	41.6	39.8
Male (%)	56.4	61.3	55	20	39.6	30.3	52.7	
Mean stone size	4.4cm	5.8cm	423.4±2 99mm <sup>2</sup>	2156.6 ±1441.2 mm <sup>2</sup>	6.9 cm	6.9 cm	6.7±3.6 cm	9.6±5.7 cm
Preop S. Cr (mg/dL)	1.14±0.40	1.58±0.98	1.13±0.43	1.67±1.33	*	*	1.05	1.54
Preop Hb (g/dL)	13.4±1.9	11.6±2.1	13.6±1.7	11.8±2.2	*	*	12.4	10.8

\* Variable not used in the article.

**Table VII***Summary of comparison of out come variables among the present study and some other studies.*

	Present Study et al, 2006		Hegarty et al, 2006		Netto et al, 2005		Muslumangolu	
	Single tract	Multiple tract	Single tract	Multiple tract	Single tract	Multiple tract	Single tract	Multiple tract
Stone clearance %	82	87	100	95	83.7	84.8	96.7	89.2
Conversion to open surgery %	2.5	6.5	*	*	*	*	0	0
Per operative bleeding deferred the procedure (%)	2.5	3.2	0	0	*	*	0.73	1.5
Bleeding necessitating blood transfusion (%)	12.8	25.8	0	20.0	13.5	39.4	7.6	18.5
Symptomatic urinary tract infection %	7.6	6.5	0	5	1.1	3.0	4.7	
Fever(>101° F)%	17.9	16.2	10	15	5.4	12.3	7.6	
Haematuria (days)	1.97± 0.93	2.23± 0.92	*	*	*	*	5.5%	
Urine leakage (hrs)	24.79± 4.15	26.73± 4.04	*	*	2.4%	0	3%	
Hospital stay (days)	3.05± 0.17	4.12± 0.15	3.42± 0.22	4.67± 0.21	3	2.4±1.1		

\* Variable not used in the article.

**Discussion**

Over time, an untreated staghorn calculus is likely to destroy the function of kidney and/or cause life threatening sepsis. Complete removal of the stone is an important goal to prevent further stone growth and any associated infection, and to preserve the renal function (Glenn et al, 2005). For these reasons, most urologists would agree that clearance is the most meaningful determinative factor of successful treatment of patients with complex calculi. For complex calculi, there are several considerations, such as open operation, ESWL, PCNL, and a combination treatment (Webb et al, 1987). The disadvantages of retreatment are increased risk of obstructive pyelonephritis due to impaction of dislodged fragment into ureter or steinstrasse in case of post ESWL patients and long treatment time before the stones were removed entirely.

PCNL is an integral component of the management of most staghorn and large-volume renal calculi. In the recently updated guidelines of the American Urological Association Nephrolithiasis Guidelines Panel on Staghorn Calculi (Preminger et al, 2005), present trend is towards the use of percutaneous monotherapy using multiple tracts as the preferred treatment option for most staghorn calculi. Although the safety of creating percutaneous renal tracts is well established, concern is still present about the use of multiple tracts for the treatment of complex calculi (Alken et al, 1984). The target endpoint of treatment for every patient undergoing PCNL is complete calculus clearance percutaneously.

The present study has been designed to compare the outcome of single tract PCNL (Group A) with multi-tract PCNL (Group B) for the management of large volume complex renal calculus. 70 patients were enrolled from admitted 246 patients with renal stone at department of Urology, Bangabandhu Sheikh Mujib Medical University, Bangladesh Medical College Hospital, Comfort Nursing Home and Popular Diagnostic Center, Dhaka as per selection criteria with age range from 70-18 years.

All procedures were done by single or multiple sub costal puncture on the basis of assessment of calculus configuration and collecting system anatomy for stone clearance. A total of 121 tracts were established in the 70 renal units. The maximal number of tracts used in a single renal unit was four (in multi-tract group range two to four). Single tracts were established in thirty nine cases, two tracts were established in sixteen patients, three tracts in ten patients and four tracts in five patients.

The age of the patients in both groups of the present study ranged between 68 and 22 years and the majority between 30 -39 years, of which 15 and 11 patients belonged to group A and group B respectively. Mean age + SD of Group A was 42.71 ± 1.95(range 22-68) and that of Group B was 41.93 ± 1.99(range 60-26) years.

The age range of the present study is comparable with the study done by Rodrigues Netto et al, 2005, Singla et al in 2008, Hegarty and Desai 2006 Liatsikos and collaborators, 2005 and Guohua et al. in 2007

Stone size was another baseline variable. In this study, only complex stones were included. The length of the stone size was calculated radio logically in centimeter. The mean stone size in Group A was 4.4(3.3- 6.9) cm

and 5.8(4.1- 8.8) cm in Group B. The stone size of both groups was compared and Group B had significantly larger stone ( $p<0.05$ ). Hegarty and Desai in 2006, mean stone size of their study was  $423.45\pm 299$  (144-1400) mm<sup>2</sup> and  $2156.6\pm 1441.2$  (55-4720) mm<sup>2</sup> in single tract and multi-tract PCNL respectively which was also significantly different in both groups.

A retrospective study by Rodrigues Netto et al. in 2005 found that the mean stone burden was 6.9 (5.2-10.8) cm. Mean stone size was  $6.7\pm 3.6$  and  $9.6\pm 5.7$  cm for single and multitract PCNL respectively in a study by Muslumanoglu and coworkers. Stone size was considerably greater in multiple tract groups in their studies.

Mean +SD operation times in this study were  $97.0\pm 3.9$  min in PCNL with single tract and  $124.0\pm 2.7$  min in PCNL with multitract including cystoscopic ureteral catheter placement ( $p<0.05$ ). This difference may be due to variation in stone size and location and skillness of operative surgeons. Ahmet Yaser Muslumanoglu and associates, 2006 observed the mean operation time was  $87.8\pm 32.5$  (range 180-50) min in their prospective study of multiple tracts PCNL. Rodrigues Netto et al in 2005 conducted a study where the average operative time was 139.1 minutes for single tract PCNL and 134.9 minutes for the multiple access groups. No significant difference was found among the groups. Aron and associates presented data where they found that the mean operative time for multiple tracts was 146 minutes. Liatsikos and collaborators in 2005 found that the average operative time of their study in multiple angular approaches was 110 minutes (180-90).

In present study mean blood loss was less in single tract group,  $347\pm 18.7$  (180-455) ml than multiple tract group  $424\pm 42.7$ (320- 960) ml. Significant difference was found among the groups ( $p<0.05$ ). Transfusion was needed in 8 (25.8%) patients of multiple tract group and in 5(12.8%) patients of single tract group ( $p>0.05$ ). The result was consistent with the previously published studies like Manish Singla et al 2008, reported in their study that 18.8%(28 out of 149) patients were needed blood transfusion in multiple tract group and they found 11.2% in single tract group of other series. Muslumanoglu and associates, 2006 reported in their study that 18.5 % ( 5 out of 65) patients were needed blood transfusion in multiple tract group and they found 7.6% (39 out of 210) in single tract group. Rodrigues Netto et al 2005 compared the blood transfusion between the two groups and were 39.4% in multi tract group and

14.3% in single tract group. Liatsikos and collaborators, 2005 observed in their study that the blood transfusion required in 45% cases of multiple angular renal accesses and average blood loss was 450 ml (range 300-1000ml). Zeng Guohua and associates, 2007 reported in their series the mean blood loss was about 112ml (range 483-64 ml).

The mean Hemoglobin (g/dL) levels preoperatively was  $13.4\pm 1.9$  (range 9.4-15.8) and  $11.6\pm 2.1$  (range 8.6-15.1); postoperatively was  $11.51\pm 1.86$  and  $9.49\pm 1.55$  in group A and group B respectively ( $p<0.05$ ). In a prospective study by Hegarty and Desai in 2006, the mean Hemoglobin (g/dL) levels preoperatively was  $13.8\pm 1.6$  (range 16.3-10.6) and  $11.8\pm 2.2$  (range 16.7-9.0); postoperatively was  $10.81\pm 1.54$  and  $9.86\pm 1.35$  in group A and group B respectively ( $p<0.05$ ).

The procedure had to be deferred in 2 patients because of hemorrhage obscuring vision and deteriorating haemodynamics of the patient. Both patients were successfully managed by conservative measures keeping the nephrostomy tube in situ and their stones were cleared in a second look PCNL session.

After completion of the procedure, patients were evaluated with fever, analgesia requirements, duration of macroscopic haematuria, urinary leakage through percutaneous tract and hospital stay.

Seven patients of PCNL with single tract and five patients of multiple tracts PCNL had fever, which was not significant. Fever was associated with urinary tract infection and with rigor following infusion, which resolved quickly after change of antibiotic according to the culture and sensitivity report and/or withdrawal of intravenous fluid.

Guohua et al. 2007, in a retrospective study found 7 (7%) patients with a postoperative fever of  $38.5^{\circ}\text{C}$  or greater. The 4 patients had bacteremia, which was cured by intravenous antibiotics. In a study done by Muslumanoglu and associates 2006 where post operative fever ( $>38^{\circ}\text{C}$ ) was occurred about 7.6% (21 out of 275) patients in multiple tract PCNL. Aron and associates, 2005 presented data in favors of multi tract PCNL for large complete staghorn calculi found twenty two patients (21%) had fever that was treated with broad-spectrum antibiotics.

Macroscopic haematuria occurred in 3 patients of single tract and 5 patients of multiple tract groups. In this study mean duration of haematuria in Group A was  $1.97\pm 0.93$



days (range 1-6 days) and in Group B was  $2.23 \pm 0.92$  days (range 1-7 days); difference was not statistically significant among the groups. Two patients, one from each group, required postoperative blood transfusion. Ahmet Yaser Muslumanoglu and associates, 2006 in a prospective study observed that haematuria occurred in 5.5% (15 out of 275) patients.

In the present study percutaneous nephrolithotomy with multiple tracts had no significantly higher analgesia requirement compare to percutaneous nephrolithotomy with single tract. In this study, the mean  $\pm$  SD of injection pethidine in mg of group A was  $187.50 \pm 14.00$  mg compared to  $194.17 \pm 15.71$  mg in group B. Rodrigues Netto et al in 2005 evaluated postoperative pain according to the amount of oral or parenteral analgesics (Meperidine) used. Patients who required no analgesics or up to one tablet daily were considered as pain free. Of the 119 patients, 77 (64.7%) were considered pain free and 42 (35.3%) as having pain. Of the 42 patients with pain, 40.5% in the single tract, and 36.4% were in the multiple access groups. No significant difference was found among the groups in their study and in the present study.

In the present study, the nephrostomy tube was removed when the color of the urine was clear and the patient was kept in the hospital for at least 12 hours thereafter. Prolonged urine leakage from tract site occurred in 3 patients (3.2%), one from group A and two from group B. In this present study, the mean urine leakage in hours from tract site was  $24.79 \pm 4.15$  and  $26.73 \pm 4.04$  for single tract and multitract PCNL respectively. Muslumanoglu et al. 2006 observed in their study that prolong urinary leakage occurred in 2.9% (8 out of 275 patients). In a comparative study by Liatsikos and collaborators in 2005 reported that urinary leakage occurred in 3% (3 out of 100 patients) cases in multiple angular renal accesses. Another study by Desai et al. in 2004 found that prolong urinary leakage occurred 4.5% (1 out of 22) and 2.9% (1 out of 34) in single tract and multiple tract group respectively. The number of percutaneous access tract is not associated with postoperative percutaneous tract site urine leak. The present study is consistence with previously published study.

In this study, it has been observed that the mean length of hospital stay  $3.05 \pm 0.17$  (range 2-7 days) and  $4.12 \pm 0.15$  (range 2-11) days for the patient of PCNL with single tract and multiple tract group respectively. The length of hospital stay in group B was higher and statistically

significant than in group A ( $p < 0.05$ ). Hegarty and Desai 2006 reported that mean length of hospital stay (days) was  $4.67 \pm 0.21$  and  $3.42 \pm 0.22$  in multiple tract group and single tract group respectively. In a retrospectively study by Rodrigues Netto and associates in 2005 found that the hospitalization time was not different among the groups, with a mean stay of 3 days ( $p > 0.05$ ). Liatsikos and collaborators observed that the mean length of hospital stay was 4.6 (14-3) days in their series. Manish Singla and associates in 2008 found the hospital stay of their patients was 6.8 (28-3) days. Muslumanoglu et al. reported in their study the mean hospital stay was  $2.4 \pm 1.1$  (range 1-7 days). In the present study, mean hospital stay for single tract PCNL was significantly less than the mean hospital stay for PCNL with multiple tracts.

There was no significant impact of PCNL on renal function in patients requiring single tract access. Present study revealed that mean of pre operative serum creatinine in multiple tract group and single tract group were  $1.58 \pm 0.98$  mg/dL (range 0.7-5.1) and  $1.14 \pm 0.40$  mg/dL (range 2.28-0.7) ( $p < 0.05$ ). In multiple tract groups, mean preoperative serum creatinine was much higher than single tract group may be due to large stone burden, delayed presentation and associated medico-renal diseases. The mean of post operative serum creatinine in single tract group and multiple tract group were  $1.24 \pm 0.58$  mg/dL and  $1.91 \pm 1.64$  mg/dL respectively ( $p < 0.05$ ). As a group, patients requiring multi-tracts had a significant postoperative increase in serum creatinine; however an increase of serum creatinine  $> 0.5$  mg/dL was seen only in patients with a high baseline serum creatinine of  $> 1.4$  mg/dL.

Hegarty and Desai, 2006 in their study, mean pre operative serum creatinine in multiple tract group and single tract group were  $1.67 \pm 1.34$  mg/dL (range 0.7-5.5) and  $1.13 \pm 0.43$  mg/dL (range 0.7-2.25) ( $p < 0.05$ ). The mean post operative serum creatinine in single tract group and multiple tract group were  $1.23 \pm 0.79$  mg/dL and  $1.87 \pm 1.85$  mg/dL respectively ( $p < 0.05$ ). These findings were consistence with present study.

In the management of patients with stone disease it does not matter how much stone burden the surgeon has cleared but from the perspective of patient satisfaction is how much is left behind. Though stone free rate varied widely reflecting the surgeon's technical skill, thoroughness and attitude in removing stone. In the present study, an overall success rate of 85.5% was achieved and higher stone clearance was observed

in patients with multi tract PCNL when compared to patients with single tract PCNL. Though mean stone burden was greater, the success rates were increased in the staghorn stones, in which multiple accesses were more commonly indicated. However, in the group of patients managed with multiple punctures, success rate was more than that achieved in the single access group, probably due to easy approach to the inaccessible calyx with multiple tracts.

In the present study, the success rate of stone clearance was 82.0% (32 out of 39 patients) and 87.0 % (27 out of 31 patients) with single tract and multiple tracts PCNL respectively. The success rate of stone clearance in a study conducted by Rodrigues Netto and associates in 2005 was 80% (56 in 70 patients) and 84.8 % (28 in 33 patients) with single tract and multiple tracts respectively. In another study by Aron and associates in 2005 reported the success rate of stone clearance was 84% with aggressive multi-tract PCNL. Complete stone clearance was achieved in 87% with multiple angular renal accesses in a study by Liatsikos and collaborators in 2005. Muslumanoglu et al. 2006 observed in their study that the success rate of stone clearance was 96.7% (203 out of 210 patients) and 89.2 % (58 out of 65 patients) with single tract and multiple tracts PCNL respectively. A prospective study by Hegarty and Desai in 2006 claimed the success rate of stone clearance with single tract and multiple tracts PCNL were 100% and 95% respectively. Zeng Guohua and associates in 2007 reported their success rate of stone clearance with minimally invasive percutaneous nephrolithotomy to treat staghorn calculi via multiple percutaneous tracts in a single session procedure was 93%(93 out of 100 patients).

**Conclusion**

With the development of instruments and increase experience, judiciously made multiple percutaneous tracts in a single session percutaneous nephrolithotomy for treating complex stones in selected cases is safe, feasible and effective within acceptable morbidity in achieving a greater stone clearance. A large multi centre comparative study may be done for further comment.

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# RENAL ARTERIOVENOUS MALFORMATIONS- REVIEW OF LITERATURE

M J KABIR

### Introduction

Renal arteriovenous malformations are abnormal communications between the intrarenal arterial and venous systems. The condition was first described by Varela in 1928<sup>1</sup>. Renal arteriovenous malformations are uncommon and usually identified during the evaluation of gross haematuria<sup>2</sup>. The estimated rate in large autopsy series is less than 1 case per 30,000 patients. But incidence of 1 per 1000-2500 patients was found to those undergoing evaluation for urologic or vascular imaging techniques. They may cause hypertension, peripheral embolization, high output cardiac failure and haematuria<sup>3</sup>. Renal arteriovenous malformations are congenital, acquired and idiopathic<sup>2</sup>. Congenital arteriovenous malformations account for less than one third of renal arteriovenous malformations. Two types of congenital renal arteriovenous malformations are described. The cirroid arteriovenous malformation is the most common type, a dilated corkscrew appearance, much like a varicose vein. The cavernous congenital arteriovenous malformation with single dilated vessels is less common<sup>4</sup>. With the increased incidence of percutaneous renal surgery, renal biopsies, penetrating renal injuries, incidence of acquired renal fistulas are increased in recent days. Acquired arteriovenous fistulas represent as many as 75-80% of renal arteriovenous malformations. Acquired renal arteriovenous anomalies are often termed renal arteriovenous fistulas. Idiopathic renal arteriovenous fistulas have the radiographic characteristics of acquired fistulas, may be associated with renal artery aneurysms, represents less than 3% of renal arteriovenous malformations<sup>4</sup>. Treatment can be tailored to the individual patient. Options for therapy range from observation to embolization to nephrectomy.

### Etiology

The etiology of congenital arteriovenous malformations is unknown. The cause of acquired arteriovenous malformations is usually known. Percutaneous renal biopsy is the most common known cause of acquired renal arteriovenous fistula<sup>5-7</sup>. Trauma is another important, although uncommon, cause of acquired renal

fistulas<sup>8</sup>. In patients with hypertension following renal trauma, renal arteriovenous malformations may occur in one third of patients. In patients with penetrating trauma, arteriovenous fistulas may affect as many as 80% of patients with post-traumatic hypertension. Trauma during ureteroscopy has recently been described as a cause of intrarenal arteriovenous fistula<sup>9</sup>. Idiopathic arteriovenous fistulas are thought to arise from the spontaneous erosion or rupture of a renal artery into a nearby renal vein. Arteriovenous malformations may also occur in the setting of malignancy. Angiogenic tumor factors have been implicated and may explain the development of arteriovenous malformations within renal tumors.

### Pathophysiology

In the cirroid congenital arteriovenous malformation, multiple communications exist between the arteries and veins. These communications develop multiple coiled channels, forming a mass within the renal parenchyma<sup>2</sup>. The communicating vessels are tortuous, dilated, and located beneath the lamina propria of the renal urothelium. This cluster of vascular channels forms a mass, with the arterial supply arising from one or more segmental or interlobar renal arteries. Its nearness to the collecting system may explain the high prevalence of hematuria<sup>2</sup>. The less common cavernous congenital arteriovenous malformation is characterized by a single artery that feeds into a single cystic chamber, with a single draining vein. Acquired arteriovenous malformation results from traumatic disruption of renal vessels. A fistulous connection between the arterial and venous systems occurs as a result of the trauma. Any renal arteriovenous malformation may result in renin-mediated hypertension.

### Presentation

Patient with arteriovenous malformations may remain asymptomatic<sup>10</sup>. They may be discovered incidentally on image studied performed on other reason. Usual mode of presentation is Gross hematuria (as many as 75% of cases)<sup>2</sup>. Sometimes the diagnostic evaluation of

patients with microscopic hematuria also may lead to the discovery of an arteriovenous malformation. Flank pain with ureteric colic from obstructing blood clots may lead to the diagnosis of arteriovenous malformation, which may be voided as wormlike masses. A significant percentage of patients with renal arteriovenous malformations are hypertensive. Cardiomegaly, congestive heart failure, or both also may be present among patients evaluated for renal arteriovenous malformations<sup>2</sup>. Rarely, a patient may present with hypotension from hemorrhage caused by an arteriovenous malformation. A physical evaluation may demonstrate findings of a flank bruit. A palpable mass is usually present in those patients with renal tumors as the cause of the fistula.

### Diagnostic workup

The laboratory evaluation is dictated by the clinical presentation of the patient. Haemoglobin and hematocrit estimation is important for correction of Anemia. Anaemia may contribute to the severity of heart failure in some patients with renal arteriovenous malformations.

Serum creatinine values are measured to assess the renal function before contrast-enhanced radiographic studies are performed. Renal function may also dictate the type and timing of surgical intervention. Prothrombin time, activated partial thromboplastin time, bleeding time should be done to exclude any coagulopathies. Urinary tract infections should be excluded before intervention is pursued.

### Imaging Studies

The initial study for the evaluation of gross hematuria depends on several factors, including location, urologist and radiologist preference, and patient factors. The successful treatment of renal arteriovenous malformations relies on definitive localization of the lesion. Meticulous radiographic evaluation is needed because some lesions are subtle. The characteristics of renal arteriovenous malformations on, ultrasound, IVU and CT scan images are described.

Ultrasound is a noninvasive means for evaluating renal causes of haematuria. On the other hand many patients incidentally diagnosed during ultrasound study. Color-duplex Doppler ultrasound studies increases the sensitivity for vascular lesions. The lesions are identified as arteriovenous malformations based on the turbulent blood flow within a cystic mass<sup>11</sup>.

CT scan is now becoming a next modality for evaluation of haematuria or renal mass lesion detected on

ultrasound examination. CT urography has replaced IVP in many centers for the initial evaluation of hematuria. With modern spiral CT scanners and IV contrast, detailed anatomic and functional information can be obtained and can lead to the accurate diagnosis of renal arteriovenous malformations. With proper equipment and oversight, CT urography, angiography, or both can provide information about renal function, as well as detailed definition of the anatomy, including the vascular and collecting systems<sup>12</sup>.

Intravenous pyelography still being used commonly for the evaluation of haematuria. Arteriovenous malformations have several characteristics on IVP images. A mass lesion may be observed on the nephrotomogram images, especially in the medullary region, with compression of the collecting system. Hypo perfusion distal to the arteriovenous malformation may be present, which manifests as a wedge-shaped defect or segmental nonvisualization. Filling defects of the collecting system may also be present. The arteriovenous malformation may cause an irregular impression on the collecting system, and clots may fill and obscure a calyx or the renal pelvis. However IVP results may be normal in patients with an arteriovenous malformation.

Magnetic resonance angiography (MRA) is a promising technology for the evaluation of renal masses<sup>13</sup>. MRA is especially useful in those patients who cannot tolerate iodine-based contrast. Several reports have confirmed the diagnostic usefulness of MRA for the diagnosis of renal arteriovenous malformation<sup>14</sup>.

Angiography remains the standard for the clinical diagnosis of arteriovenous malformation<sup>15</sup>. Angiography of an arteriovenous malformation demonstrates rapid contrast visualization in the inferior vena cava within seconds of contrast injection because of the rapid shunting of blood from the arterial system to the venous system. Decreased density on the nephrogram also may appear distal to the arteriovenous malformation. The actual malformation may be a subtle blush if the arteriovenous malformation is small, or the multiple small tortuous vessels may be easily visualized. Cirroid arteriovenous malformations are supplied by multiple arteries, while the cavernous arteriovenous malformations and arteriovenous fistulas tend to be supplied by single vessels.

Cystoscopy should be performed to evaluate for coincidental lower tract pathology. Cytological evaluation of the urine is also useful for screening for carcinoma in

situ of the bladder, which can be missed during diagnostic Cystoscopy.

## **Treatment**

### *Medical Therapy*

Conservative therapy can be used safely in some cases. Acquired arteriovenous fistulas tend to resolve spontaneously<sup>4</sup>. A recent report describes spontaneous resolution of an arteriovenous malformation. Asymptomatic small lesion without any hemodynamic complications may warrant observation. Medical management is also essential to optimizing outcome before surgical intervention. In addition to relieving pain, hypertension should be treated. Heart failure must be controlled. Blood transfusions may be needed for the patient with hemorrhage from an arteriovenous malformation.

### *Intervention*

The initial therapy for treatment of arteriovenous malformations is usually angiographically guided embolization of the malformation (16-19). Numerous substances have been injected in an effort to ablate the arteriovenous malformation. Initial attempts at embolization were complicated by recurrence of the arteriovenous malformation. This was thought to be due to the type of material used for embolization. Materials that have been used for embolization include steel coils, autologous blood clots, gelatin sponges and foams, and synthetic polymers. Super selective embolization with coils and microspheres has also been described<sup>17</sup>.

The most effective material for embolization appears to be absolute alcohol, which is relatively inexpensive. Injection through the catheter lumen is also easier than with many of the synthetic materials<sup>19</sup>. Balloon catheters are used to occlude the feeding artery to prevent retrograde migration of the alcohol. The alcohol denatures the proteins within the wall of the arteriovenous malformation, thereby inducing thrombosis and occlusion of the malformations. Repeat treatments may be needed to completely ablate the arteriovenous malformation. Epinephrine injection before embolization may make the procedure more effective by inducing vasospasm, thereby concentrating the injected material within the arteriovenous malformation. Contrast-induced nephropathy and allergic reactions may occur during embolization technique. The agent used for embolization may migrate or be misdirected and thus cause damage to normal renal tissue or other organs. A recent case description noted coil and guidewire erosion into the

colon<sup>20</sup>. Alcohol may cause transient headaches and mild intoxication. Recurrence or persistent fistulas are possible. Hematomas and pseudo aneurysm at the puncture site are not uncommon.

### *Surgical Therapy*

The treatment most likely to cure an arteriovenous malformation is total or partial nephrectomy. Total nephrectomy is indicated for large cirroid arteriovenous malformations<sup>21</sup>. In most cases, nephrectomy is reserved for patients in whom more conservative therapy has failed. If the fistula is due to malignancy, then radical nephrectomy is usually indicated<sup>2</sup>.

Partial nephrectomy has been accepted as a safe treatment for small, polar lesions<sup>2</sup>. In many centre's laparoscopic partial and total nephrectomy have also been used with increasing frequency to treat selected renal arteriovenous malformations<sup>22</sup>. Recurrence arteriovenous fistulas may occur following partial nephrectomy which may be silent and discovered incidentally during subsequent imaging studies. They also may manifest with signs or symptoms similar to the original arteriovenous malformation.

Small malformations located in the peripheral aspect of the kidney may be treated by ligation of feeding vessels. The dissection of the feeding vessels may be technically difficult. Bench surgery with auto transplantation may facilitate the successful treatment of large and/or centrally located malformations<sup>23</sup>. This degree of renal reconstruction is rarely necessary but may preserve enough functional renal tissue to avoid dialysis in select cases.

## **Conclusion**

Renal arteriovenous malformations remain an uncommon clinical problem. High index suspicion is necessary while evaluation a renal lesion with gross haematuria or hypertension. Several case reports describe clinical situations in which a renal arteriovenous malformation was classified incorrectly as a malignant tumor or as hydronephrosis. Specific CT scan protocols seem especially promising as a minimally invasive way to improve the classification of renal masses. Further, improvements in MRI, MRA, and Doppler ultrasound may decrease the need for the use iodinated contrast agents. Angiographic embolization treatment is now the usual first line of therapy because it can be accomplished at the time of diagnosis, with little morbidity. However nephrectomy remains the criterion standard for treating renal arteriovenous malformations.



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## CASE REPORT

# CASE REPORT ON TRANSITIONAL CELL CARCINOMA OF MALE URETHRA

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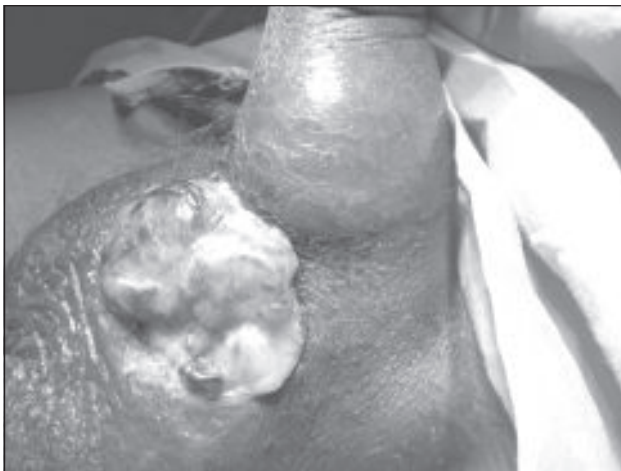
### Introduction

Carcinoma of the male urethra is rare and usually presents in the fifth decade of life. More than half of patients have a history of urethral stricture disease, almost one fourth have a history of sexually transmitted disease, and 96% are symptomatic at presentation<sup>1</sup>. The most common presenting symptoms are urethral bleeding, a palpable urethral mass, and obstructive voiding symptoms. Tumors of the male urethra are categorized according to location and histologic features of the cells lining the urethra<sup>2</sup>. Penile urethra is involved in 30%; carcinomas of the penile urethra are of squamous cell origin in 90% and of transitional cell origin in 10%; Male urethral carcinoma can spread by direct extension to adjacent structures, usually involving the vascular spaces of the corpus spongiosum and the periurethral tissues, or it can metastasize through lymphatic embolization to regional lymph nodes. The lymphatics from the anterior urethra drain into the superficial and deep inguinal lymphnodes Hematogenous dissemination is uncommon except in advanced disease As in penile carcinoma, the primary form of treatment for men with urethral carcinoma is surgical excision. In general, anterior urethral carcinoma is more amenable to surgical control, and the prognosis is better than that

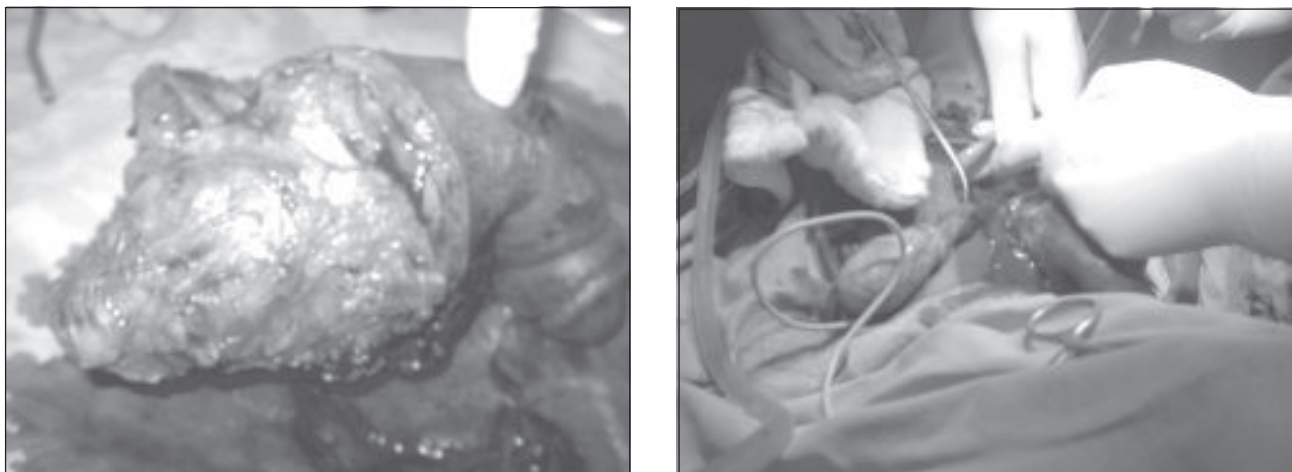
of posterior urethral carcinoma. A large series reported overall survival rates of 83% for low-stage tumors, 36% for high-stage tumors, 69% for anterior tumors, and 26% for those in the posterior urethra. As opposed to penile carcinoma, benefit from prophylactic inguinal lymph node dissection has not been demonstrated in urethral cancer<sup>1</sup>.

### Case Report

A 45 year old gentleman coming from Munshigonj presented with obstructive voiding symptoms for 3 months and burning urethral syndrome. Suddenly he developed acute retention of urine and attend emergency dept of Mitford Hospital where per urethral catheter was tried and failed to negotiate but retention was relieved by supra pubic cystostomy .Then he was admitted in urology dept of SSMC & MH where urethrocystoscopy was tried and failed to pass beyond proximal urethra but took a biopsy from the urethra which revealed transitional cell carcinoma. Subsequently, patient developed urethro cutaneous fistula. Then this patient was referred to urooncology unit of BSMMU. On examination there is a fungating growth in the root of the penis which invades the surrounding scrotal wall (fig a). Urine was coming from the fistula,



**Figure:** (a) *Fungating growth at the root of the penis with urethrocutaneous fistula.* (b) *Left testis being repositioned after excision of mass.*



**Fig.-1:** (c) Reseted specimen. (d) Perineal urethrostomy and wound before closure.

Inguinal lymph node were not palpable. Digital rectal examination revealed normal prostate and rectal mucosa was normal. Incision biopsy was taken revealed transitional cell carcinoma. CT scan showed growth involving the proximal urethra with crus but no bony involvement. Kidneys and ureters and urinary bladder were found normal. Patient was prepared for operation. Total amputation of penis with total scrotoectomy was done along with right total orchodectomy (fig b,c,d). Left testis was repositioned in the upper thigh. Post operative period was uneventful. Patient was discharged on 12<sup>th</sup> post operative day and referred to oncologist for radio and chemotherapy.

### Discussion

Carcinoma of the male urethra is rare and usually presents in the fifth decade of life<sup>1</sup>. Etiologic factors include chronic inflammation due to a history of frequent sexually transmitted diseases, urethritis, and urethral stricture, and there is likely to be a causal role for human papillomavirus 16 in squamous cell carcinoma of the urethra<sup>2</sup>. The onset of malignant change in a patient with chronic urethral stricture disease may be insidious, and a high index of clinical suspicion is required to diagnose these tumors expediently. More than half of patients have a history of urethral stricture disease, almost one fourth have a history of sexually transmitted disease, and 96% are symptomatic at presentation. The most common presenting symptoms are urethral bleeding, a palpable urethral mass, and obstructive voiding symptoms<sup>1</sup>.

### Pathology

Tumors of the male urethra are categorized according to location and histologic features of the cells lining the urethra<sup>3</sup>. The bulbomembranous urethra is involved most frequently, accounting for 60% of tumors, followed by the penile urethra (30%) and the prostatic urethra (10%). Overall, 80% of male urethral cancers are squamous cell carcinoma; 15% are transitional cell carcinoma; and 5% are adenocarcinoma, melanoma, lymphoma, paraganglioma, sarcoma, or undifferentiated tumor. The histologic subtype of urethral cancer also varies by anatomic location. Carcinomas of the prostatic urethra are of transitional cell origin in 90% and of squamous cell origin in 10%; carcinomas of the penile urethra are of squamous cell origin in 90% and of transitional cell origin in 10%; and carcinomas of the bulbomembranous urethra are of squamous cell origin in 80%, of transitional cell origin in 10%, and adenocarcinoma or undifferentiated in 10%<sup>4</sup>.

Male urethral carcinoma can spread by direct extension to adjacent structures, usually involving the vascular spaces of the corpus spongiosum and the periurethral tissues, or it can metastasize through lymphatic embolization to regional lymph nodes. The lymphatics from the anterior urethra drain into the superficial and deep inguinal lymph nodes and occasionally into the external iliac lymph nodes. Tumors of the posterior urethra most commonly spread to the pelvic lymph nodes. Palpable inguinal lymph nodes occur in about 20% of cases and almost always represent metastatic disease, in contrast to penile cancer, in which a large percentage of palpable nodes may be inflammatory. Hematogenous dissemination is uncommon except in advanced disease.

### Evaluation and Staging

The tumor, nodes, metastasis (TNM) staging classification is based on depth of invasion of the primary tumor and presence or absence of regional lymph node involvement and distant metastasis. Examination under anesthesia consisting of cystoscopy and bimanual palpation of the external genitalia, urethra, rectum, and perineum aids in evaluating the extent of local involvement by tumor. Transurethral or needle biopsy of the lesion is also performed<sup>5</sup>. If rectal involvement is suspected on bimanual examination or by the patient's symptoms, an evaluation of the lower colon by barium enema study and flexible sigmoidoscopy is recommended to assist with surgical planning. Local soft tissue involvement, lymph node involvement, and bone extension are best evaluated by a computed tomographic scan of the abdomen and pelvis or by magnetic resonance imaging. Magnetic resonance imaging may be helpful for detecting invasion of the corpora cavernosa and is a useful staging modality<sup>6</sup>.

### Treatment

As in penile carcinoma, the primary form of treatment for men with urethral carcinoma is surgical excision. In general, anterior urethral carcinoma is more amenable to surgical control, and the prognosis is better than that of posterior urethral carcinoma, which is often associated with extensive local invasion and distant metastasis. A large series reported overall survival rates of 83% for low-stage tumors, 36% for high-stage tumors, 69% for anterior tumors, and 26% for those in the posterior urethra<sup>7</sup>.

### Carcinoma of the Penile Urethra

Transurethral resection, local excision, or distal urethrectomy and perineal urethrostomy may be acceptable treatment in selected patients with superficial, papillary, or low-grade tumors. Long-term disease-free survival has been reported in this setting<sup>7-11</sup>. Partial penectomy with a 2-cm negative margin is the treatment of choice for tumors infiltrating the corpus spongiosum and localized to the distal half of the penis. Excellent local control after this procedure has been documented<sup>12-17</sup>. If invasive disease extends to or involves the proximal penile urethra, total penectomy is required to obtain an adequate margin of excision. In the largest series to date, a local recurrence rate of 13% was reported after this procedure<sup>12</sup>.

Accurate staging is important to avoid underestimation of the proximal extent of the tumor. Review of previous data would suggest that radical penectomy is an

insufficient operation for bulbous urethral tumors. There have been limited reports of urethrectomy alone with perineal urethrostomy for infiltrating tumors confined to the corpus spongiosum. The benefits of this more conservative approach need to be weighed against the probability of local relapse or dissemination of disease. Ilioinguinal lymphadenectomy is indicated in the presence of palpable inguinal lymph nodes without evidence of metastatic disease. Benefit from prophylactic inguinal lymph node dissection has not been demonstrated in urethral cancer<sup>17</sup>.

### Radiation Therapy and Chemotherapy

Although some instances of tumor control by irradiation have been reported. Radiation therapy has the advantage of preserving the penis, but it may result in skin ulceration or necrosis, urethral stricture, or chronic edema, and it does not prevent new tumor occurrence. The long-term results of radiotherapy are difficult to evaluate because few reports are available of patients treated with this modality<sup>18,19</sup>.

A small number of studies have reported the results of neoadjuvant and adjuvant combination chemotherapy in patients with advanced stage or metastatic disease. A regimen including methotrexate, vinblastine, doxorubicin, and cisplatin (M-VAC) has been noted to have activity against transitional cell carcinoma but was ineffective against other tumor histologic types. Dinney and colleagues reported long-term survival in four of eight patients who presented with metastatic urethral carcinoma and were treated with cisplatin-based chemotherapy and surgical excision. On the basis of this experience, their favored regimen was noted to consist of cisplatin, bleomycin, and methotrexate for squamous cell carcinoma and M-VAC for transitional cell carcinoma<sup>15</sup>.

The combination of chemotherapy and radiation therapy has shown some success in a small number of patients with localized and metastatic urethral cancer. More commonly, these forms of treatment are combined with surgery in a multimodal approach in patients with advanced stage or metastatic disease<sup>20</sup>.

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## ABSTRACT FROM CURRENT LITERATURE

### Failing to achieve a nadir prostate-specific antigen after combined androgen blockade: Predictive factors

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**Objectives:** To determine the optimal cut-off of a nadir prostate-specific antigen (PSA) for prediction of progression within 24 months after combined androgen blockade (CAB) and to analyze predictive factors of failing to achieve the nadir PSA.

**Methods:** We retrospectively reviewed the medical records of 343 patients with prostate cancer treated with CAB from 2000 to 2005. We determined the nadir PSA level that predicts progression to hormone refractory prostate cancer (HRPC) at 24 months after CAB. Predictive

factors for failing to achieve a determined nadir PSA were analyzed.

**Results:** Mean age was 74.0 years. Mean follow up was 42.1 month. Seventy-seven patients experienced progression to HRPC. A nadir PSA of 1.0 ng/mL predicts progression to HRPC at 24 months. Predictive factors for failing to achieve a nadir PSA of 1.0 ng/mL or less include pretreatment PSA, percentage positive biopsy core, Gleason score, serum hemoglobin, stage, and extent of bone metastasis in univariate analysis. Pretreatment PSA (>50 ng/mL) and serum hemoglobin (<12 g/dL) were significant factors to predict failing to achieve a nadir PSA of 1.0 ng/mL or less in logistic regression analysis.

**Conclusions:** A nadir PSA of 1.0 ng/mL can predict progression to HRPC after CAB. Pretreatment PSA and serum hemoglobin are significant predictors of failing to achieve a nadir PSA of 1.0 ng/mL or less.

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### Evaluation of docetaxel plus estramustine in the treatment of patients with hormone-refractory prostate cancer

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**Objectives:** To investigate the feasibility and efficacy of docetaxel-based chemotherapy in patients with hormone-refractory prostate cancer (HRPC).

**Methods:** Forty-six consecutive HRPC patients treated between January 2003 and March 2008 were included in this analysis. Docetaxel was given at a dose of 35 mg/m<sup>2</sup> twice every 3 weeks and oral estramustine concurrently for three consecutive days during weeks 1 and 2 of each cycle. During each treatment week, the dose of estramustine was 1260 mg on the first day, 980 mg on the second day and 840 mg on the third day. Patients were premedicated with 4 mg twice a day of oral dexamethasone for three consecutive days. Treatment was continued until evidence of disease progression or unacceptable toxicity. Prostate-specific antigen (PSA) levels were evaluated at least once every 4 weeks.

**Results:** Patients received a median of three cycles of chemotherapy. Of the evaluable 46 patients, 25 (54%) had a  $\geq$ 50% PSA decline and 12 (26%) had a  $\geq$ 75% PSA decline. Median time to PSA progression and overall survival time were 10.1 and 27.0 months, respectively. Median follow-up was 15.0 months. Major severe toxicities were grade 3 or 4 leukopenia in five (11%) patients. Mild toxicities included grade 1 or 2 nausea in eight (17%) patients. Two patients could not continue the treatment because of interstitial pneumonitis and a gastric hemorrhage, respectively.

**Conclusions:** Docetaxel plus estramustine chemotherapy represents an active and well tolerated treatment for Japanese HRPC patients.

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### Safety of transperineal 14-core systematic prostate biopsy in diabetic men

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**Objectives:** To examine whether the transrectal ultrasound-guided transperineal 14-core prostate biopsy can be carried out safely in diabetic men and to determine adequate antimicrobial prophylaxis protocol in this setting.

**Methods:** The present study included 539 men, 135 with concurrent diabetes mellitus (DM) and 404 without DM, who underwent transperineal extended 14-core biopsy due to elevated prostate-specific antigen  $\geq 2.5$  ng/mL and/or abnormal digital rectal examination. Any complication requiring prolonged hospitalization or rehospitalization during the 4-week post-biopsy period was considered major. All other complications were considered minor. Intensity of antimicrobial prophylaxis was prospectively reduced in a stepwise manner down to single dose of oral levofloxacin.

**Results:** Except for DM, there was no significant difference in clinical background between the diabetic and non-diabetic men. The procedure was completed in all revealing prostate cancer in 42% of the diabetic men and 36% of the non-diabetic men ( $P = 0.23$ ). Incidence of minor or major complications was not significantly different between the two groups. Minor complications were observed in 15.6% and 16.6% of each group, respectively, with voiding disturbance being the most common. No infectious major complication was observed regardless of the presence of DM. In the diabetic men, there was no statistical difference in incidence of biopsy-related complications according to modality of DM treatment, HbA1c level or antimicrobial prophylaxis protocol.

**Conclusions:** Transperineal 14-core biopsy can be carried out without major infectious complications in diabetic men. Oral levofloxacin 300 mg once before the procedure seems to represent an effective antimicrobial prophylaxis in diabetic men without other risk of infection.

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### Nephrectomy improves survival in patients with invasion of adjacent viscera and absence of nodal metastases (stage T4N0 renal cell carcinoma)

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**Objective:** To examine the cancer-specific mortality (CSM) of patients with T4N0–2M0 renal cell carcinoma (RCC) treated with either nephrectomy (RN) or no surgery (NS).

**Patients and Methods:** Of 43 143 patients with RCC identified in the Surveillance, Epidemiology and End Results database, 310 had tumours involving adjacent organs with no evidence of distant metastases (T4NanyM0) and had RN (246, 79.4%) or NS (64, 20.6%). Kaplan-Meier analyses, Cox regression and competing risks regression models were used to compare the effect of RN vs NS on CSS.

**Results:** In patients with T4N0 disease the median survival benefit associated with RN vs NS was 42 months (48 vs 6 months,  $P < 0.001$ ). Conversely, the median survival in patients T4N1–2 was no different between RN and NS (9.3 vs 9.1 months,  $P = 0.9$ ). Multivariable analyses in T4N0 cases indicated a substantial survival disadvantage for patients having NS vs RN (hazard ratio 4.8,  $P < 0.001$ ). Conversely, in patients with N1–2 stages, the CSS was virtually the same for NS and RN (hazard ratio 0.9,  $P = 0.9$ ). Competing-risks regression models confirmed the benefit of RC in patients with T4N0 and the lack of benefit in those with T4N1–2 disease, after controlling for other cause mortality.

**Conclusion:** Our data suggest a survival benefit in patients with T4N0 RCC treated with RC. By contrast, RN seems to have no effect on survival in patients with evidence of nodal metastases.

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**Tubeless percutaneous nephrolithotomy: 3 years of experience with 454 patients**

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Objective: To present our experience with 454 patients who had tubeless percutaneous nephrolithotomy (TPCNL) over last 3 years.

Patients and Methods

From September 2004 to August 2007, all patients aged >14 years and undergoing PCNL were considered for TPCNL. Exclusion criteria were the presence of pyonephrosis, matrix calculi, significant bleeding or residual stone burden and need for three or more percutaneous accesses. These patients had a nephrostomy tube placed after PCNL (control group). The remaining patients undergoing TPCNL (study group) had antegrade ureteric stenting. Demographic and perioperative data were compared retrospectively.

Results: Of 840 patients who had PCNL during the study period, 454 had TPCNL. The two groups had comparable demographic data except for a smaller stone burden (322.8 vs 832.2 mm<sup>2</sup>) and fewer staghorn calculi (94vs 154) in patients undergoing TPCNL ( $P<0.001$ ). The mean number of tracts per renal unit and operative duration were statistically higher in patients undergoing standard PCNL (1.5 vs 1.1, and 68.8 vs 52.2 min, respectively). The decrease in haemoglobin, complication and stone-free rates were comparable. TPCNL was associated with less postoperative pain, analgesia requirement and earlier discharge ( $P<0.001$ ).

Conclusions: TPCNL can be used with a favourable outcome and no increase in complications in selected patients, with the potential advantages of decreased postoperative pain, analgesia requirement and hospital stay. Its application can be extended to patients with a solitary kidney, previous ipsilateral open surgery, raised serum creatinine level, in the presence of three renal accesses or supracostal access, and in patients undergoing bilateral synchronous PCNL or contralateral endourological stone treatment.

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**Should being aged over 70 years hinder penile prosthesis implantation?**

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Objective: To assess the satisfaction profiles following penile prosthesis surgery in patients with erectile dysfunction (ED) in their seventh decade of life.

Patients and Methods: In all, 174 patients received, for the first time, a penile prosthesis between 1990 and 2007 in our department. Among these, 35 patients were aged e"70 years at prosthesis implantation. Of these, 18 patients were still alive at the time of follow-up. Using a telephone survey, patients were asked to answer the Erectile Dysfunction Inventory of Treatment Satisfaction (EDITS) as well as the International Index of Erectile Dysfunction (IIEF). Another question in the survey was developed by the authors based on a comprehensive review of the literature, which assessed the usefulness of the device for the patient and the degree of their usage. This was formulated as follows: How many times per 2 weeks do you have a sexual intercourse?

Results: In all, 15 of 18 patients were either very or somewhat satisfied (83%). At follow-up 11 out of 15 (73%) patients were using their prosthesis regularly. The mean IIEF and EDITS scores were 21.80 and 75.20, respectively.

Conclusion: A penile prosthesis remains a highly promising treatment in older patients with a similar satisfaction rate to those published for younger patients. Thus, the motivation of the patient and not the age of the patient should be the main determinant factor in this surgical procedure.

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**The 7-year outcome of the tension-free vaginal tape procedure for treating female stress urinary incontinence**

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Objective: To evaluate the long-term results and predictive risk factors for efficacy after the tension-free



vaginal tape (TVT) procedure for treating female stress urinary incontinence (SUI).

**Patients and Methods:** In all, 306 women (mean age 50.7 years, SD 8.7) who had a TVT procedure for SUI were selected and followed for 7 years (mean 92.3 months, range 84–110) after surgery. We analysed the long-term results, the variables predictive of cure rates, and patient satisfaction.

**Results:** The overall 7-year cure rate was 84.6%, with a satisfaction rate of 69.3%. The cure rates were lower in patients with high-grade SUI (50% in grade III, 82.8% in grade II and 90.7% in grade I;  $P < 0.001$ ). On multivariate analysis, there were no independent risk factors related to cure rate, and urgency was the only factor independently associated with patient satisfaction ( $P = 0.008$ ; odds ratio 2.47). Seventy-one patients (23.2%) had complications at the 1-month follow-up after surgery, but only eight (2.6%) had complications at the 7-year follow-up, including mesh exposure in six and de novo urgency in two.

**Conclusion:** The absence of long-term adverse events associated with the TVT procedure, and high subjective and objective 7-year success rates with no independent predictive factors affecting the long-term cure rate, make the TVT procedure a recommendable surgical treatment for female SUI.

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### **Sexual function among women with stress incontinence after using transobturator vaginal tape, and its correlation with patient's expectations**

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**Objective:** To evaluate changes in female sexual function after a transobturator vaginal tape (TOT) procedure for treating genuine stress urinary incontinence (SUI), and its correlation with patient's expectation.

**Patients and Methods:** The study included women treated with a suburethral TOT for genuine SUI, neurologically intact, heterosexual and married, aged >18 years, with no previous history of malignancy, pelvic radiotherapy and no other associated surgical or

psychological diseases. Patients were interviewed before surgery and with the aid of a questionnaire including female sexual function, the Beck depression indices and their expectation of sexual function after surgery.

**Results:** Sixty-two premenopausal sexually active women were included (mean age 40.5 years). The cure rate from SUI was 92%, 89%, 87% and 84% at 6, 12, 18 and 24 months, respectively. All patients attended the visit before and the first visit after surgery, while 71%, 42% and 24% were assessed at the 12-, 18 and 24-month visits, respectively. The mean follow-up was 12 months. Fifty-two women resumed their sexual activity early within the 8 weeks after surgery and the frequency of coitus in more than two-thirds of patients was at least once per month. The number of women who expected either looseness or tightness of the vagina was more than that estimated from patient perceptions. There was a difference between the patient's sensation of vaginal length abnormalities during coitus (two women) and patient expectation (18 women).

**Conclusion:** Although the TOT is effective for treating SUI, counselling the patient and her partner is important in correcting false ideas and expectations about future sexual activity. Indeed, sexual dysfunction is reported after vaginal surgery, with a physiological and psychological background. Further assessment should be used to characterize sexual dysfunction after vaginal surgery for SUI to find new solutions.

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### **Technical description and outcomes of a continuous anastomosis in open radical prostatectomy**

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**Objective:** To describe the surgical technique, objective and subjective medium-term outcomes of a novel continuous vesico-urethral anastomotic suture in open radical prostatectomy (ORP).

**Patients and Methods:** A continuous anastomosis comprising separate anterior and posterior monofilament 3–0 polydioxanone sutures, with the bladder neck 'parachuted' down on to the urethral stump, was used in 39 consecutive patients. A cystogram was taken after

ORP in the first 23 patients. The catheter was removed as soon as patients were fully mobile. A validated postal questionnaire to determine continence and its effect on quality of life was sent to all patients e"3 months after ORP.

Results: The mean follow-up was 18 months; there were no major complications. There was an insignificant or no leak in 91% of the patients who had a cystogram. Before discharge, 33 patients reported that they were continent, whilst five required a pad(s) for stress incontinence, and one was discharged with a catheter after failing the first catheter removal. Of the 95% who completed the questionnaire, 95% either did not leak urine, or only leaked a small amount; 84% of patients reported that leaking had a minimal effect on everyday life. No patients developed symptomatic urethral or bladder neck stricture/ contracture.

Conclusions: Our technique of continuous anastomotic suturing for ORP is safe, reliable and well tolerated. Further randomized studies are warranted to compare the outcome with the standard interrupted vesico-urethral anastomosis.

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**Bladder neck contracture after radical retropubic prostatectomy using an intussuscepted vesico-urethral anastomosis: incidence with long-term follow-up**

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Objective: To evaluate the incidence of bladder neck contracture (BNC), a known complication of radical retropubic prostatectomy (RRP), after a 9-year experience by one surgeon using a novel approach to lower urinary tract reconstruction, the intussuscepted vesicourethral anastomosis (IVUA).

Patients and Methods: After institutional review board approval, the charts of 406 patients who had RRP for clinically localized prostate cancer from March 1998 to July 2007 were reviewed retrospectively. All patients had lower urinary tract reconstruction using the IVUA technique, which involves a looped urethral suture using six double-armed sutures that are drawn 'inside-to-out' from staggered points on the urethral stump through the bladder neck opening. When the sutures are tied down, the urethra is intussuscepted into the bladder neck opening.

Results: At a median follow-up of 48 months, three patients developed BNC: one was at increased risk secondary to a previous TURP; one had his catheter removed on the second day after RRP in the presence of a suprapubic tube and developed a BNC at his 'dry' anastomosis; and one with no risk factors developed a BNC. Balloon dilatation, laser incision and self obturation were successful in stabilizing the strictures while preserving continence. Overall, the incidence of BNC in this series was three of 406 (0.74%).

Conclusions: IVUA gives a lower incidence of BNC over a long-term follow-up than rates cited in previous reports. IVUA is a valuable technique for lower urinary tract reconstruction in patients undergoing RRP.

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