Impact of case volume per year on flexible Ureteroscopy practice: an internet based survey

Omar Alhunaidi, Abdulrahman A. Ahmad, Ahmed R. EL-Nahas, Bader Akroof, Ali Alamiri, Feras Al-Ajrawi, Abdullatif Al-Terki and Mohamed El-Shazly

Abstract

Background: To report current worldwide variation in techniques and clinical practice of flexible ureteroscopy (FURS) among endourologists of different case volumes per year.

Methods: Two invitations to complete an internet survey were emailed to Endourological Society members. Some of survey questions asked about indications of using FURS for renal and upper ureteral stones. Others were concerned with clinical practice of FURS (such as preoperative stenting, use of ureteral access sheath (UAS) and safety guidewire, technique of Laser lithotripsy and fragment retrieval, and post-FURS stenting. Responders were distributed into two groups; high-volume (> 100 cases/year) and low-volume surgeons (< 100 cases/year) and data were compared between both groups.

Results: Responses were received from 146 endourologists all over the world (62 high-volume and 84 low-volume). FURS for intrarenal stone > 20 mm was used by 61% of high-volume surgeons compared with 28.6% for low-volume (P < 0.001). Semirigid URS was used for upper ureteric stones in 68% among high-volume group and 82% in low-volume group (P = 0.044). UAS was used by 62% in low-volume group and 69% in high volume group (P = 0.516). Laser stone dusting was preferred by 63% in low-volume group versus 45% by high-volume (P = 0.031). More responders in low-volume group preferred to leave the stent for 6 weeks (P = 0.042).

Conclusions: The use of FURS for treating upper tract calculi has expanded by high volume endourologists to include large renal stones > 20 mm. Low-volume surgeons prefer to use semi-rigid URS for treatment of upper ureteral stones, to apply Laser stone dusting and maintain ureteral stents for longer periods.

Keywords: Flexible ureteroscopy, Survey, Stones, Ureteral access sheath, Flexible URS

Background

Treatment of upper urinary tract calculi has changed in recent years because of development of minimally invasive techniques such as flexible ureteroscopy (FURS) and miniaturized percutaneous nephrolithotomy (mini, ultra-mini and micro PCNL) [1]. Technological advances in FURS design (such as improved active tip deflection and digital image transfer), Laser lithotripsy techniques, advances in instruments as tipless baskets and ureteral access sheath (UAS) have resulted in increasing the utilization of FURS in treatment of renal and upper ureteric calculi. European Association of Urology (EAU) Guidelines recommended shock waves lithotripsy (SWL) and endourological for treatment of renal stones < 2 cm [2]. AUA guidelines recommended PCNL for treatment of large renal stones < 2 cm [3]. However, some experienced authors reported successful and safe use of FURS for treating larger stone burdens < 2 cm [4, 5].

The large variety of instruments used during FURS offered increased surgical efficiency, decreased frequency and severity of complications, and improved cost effectiveness. Many controversies in FURS indications, techniques and utilization of available instruments were addressed in previous surveys [6, 7]. However, the effect
of case volume per year on selection of certain indica-
tions, utilization of specific techniques and preference of
instruments was reported in only one study that in-
volved only European urologists [7]. High-volume URS
cases per year was proved to result in better outcomes
(such as shorter operative time, better stone free rates,
shorter hospital stay, less need for retreatment, fewer
and less severe complications) when compared with
lower case-volume [8].

This study was conducted to report current worldwide
variation in techniques and clinical practice of FURS among
endourologists of different FURS workload per year.

Methods
Study design
An email invitation was sent to Endourological soci-
ety members to answer an anonymous online survey in June
2017. A reminder email was sent after one month. The
survey was conducted through SurveyMonkey® system
and responses were collected over three months. By
accepting the invitation to complete the online survey,
all participants provided their informed consent to take
part in the study. This study design did not require eth-
ical approval because no patients were included.

Survey
The online questionnaire contained 14 questions (three
questions asked about country, period of doing FURS
and number of FURS per year, two asked about using
FURS for upper ureteral and large renal stones and 9
questions were concerned with clinical practice of FURS
(such as preoperative stenting and urine culture, use of
ureteral access sheath (UAS) and safety guidewire, type
of FURS (fiberoptic or digital), technique of Laser litho-
tripsy and fragment retrieval, post-FURS stenting indica-
tions and period).

Participants
Responders were divided into two groups based on
number of cases per year, high-volume surgeon with >
100 case/year and low-volume surgeon < 100 case/year
[6]. FURS technical details and practice were compared
between the two groups.

Statistical analysis
Statistical analysis was performed using SPSS V20 soft-
ware (USA). All variables were categorical and were
expressed as numbers and percentages. Chi-square test
was used to compare the difference between both groups.
P Value < 0.05 was considered statistically significant.

Results
Participants
The survey was answered by 146 responders of 1204
(12%) Endourological society members from 40 coun-
tries. They represent all continents (50 from North
America, 42 from Europe, 29 from Asia, 16 from South
America and 9 from Africa).

Differences between high and low-volume Endourologists
Table 1 summarized the comparison between both
groups. High-volume surgeons were practicing FURS for
significantly longer periods than low-volume group
(P < 0.001). FURS for intrarenal stones > 20 mm was
used by 61.3% of high-volume group versus 28.6% of
low-volume group (P < 0.001). Semi-Rigid ureteroscopy
for upper ureteric stone was more frequently preferred
by low-volume group (82%) in comparison with 68% in
high-volume group (P = 0.044). Stone dusting was pre-
ferred by 63% by low-volume group versus 45% by high-
volume (P = 0.031). Another significant difference was
the period of post-URS stents as more responders in
low-volume group preferred to leave the stent for 6
weeks (P = 0.042).

Similarities between high and low-volume Endourologists
Regardless of the case volume per year, most responders
(96%) used FURS in non-stented ureters, 80% request
preoperative urine culture, 76% were using semirigid
URS for upper ureteric stones and 70% used a basket for
retrieval of stone fragments after disintegration. Two
third of responders routinely uses a safety guidewire and
UAS during FURS (Table 1).

Discussion
The superior results of surgeons with higher volume
URS cases in comparison with others with lower volume
cases was attributed to increasing surgical experience of
the treating team (endourologist, nurses and technicians)
[8]. In the present study, we reported the effect of case-
volume per year on clinical practice and preference of
certain instruments and surgical techniques of FURS.

High-volume responders in the present survey per-
formed significantly more FURS for renal calculi > 20
mm despite that EAU and American Urological Associ-
ation (AUA) guidelines [2, 3] that recommended PCNL
as the first line for this stone size. However, high-
volume endourologists used their experience to reach ef-
ficient outcomes [5, 8]. Moreover, we observed an in-
crease in the overall preference of FURS for large renal
stones among all responders (42%) in comparison with
the survey conducted by Dauw et al. who reported 11%
[6]. This may be explained by the increased experience
of FURS surgical techniques and advances in Laser litho-
tripsy technology.
Table 1 Comparison between high and low-volume groups

| Variable                              | Low-volume (< 100 cases/year) | High-volume (> 100 cases/year) | P value | Total 146 |
|---------------------------------------|-------------------------------|--------------------------------|---------|-----------|
| Years of doing FURS                  |                               |                                 | < 0.001 |           |
| < 5 Years                             | 23 (27.4)                     | 6 (9.7)                         | 29 (20) |           |
| 5–10 Years                            | 28 (33.3)                     | 12 (19.3)                       | 40 (27.3)|           |
| > 10 Years                            | 33 (39.3)                     | 44 (71)                         | 77 (52.7)|           |
| FURS for stones >2 cm:                |                               |                                 | < 0.001 |           |
| Yes                                   | 24 (28.6)                     | 38 (61.3)                       | 62 (42.5)|           |
| No                                    | 60 (71.4)                     | 24 (38.7)                       | 84 (57.5)|           |
| Semi-Rigid URS for Upper Ureteric Stones: |                         |                                 | 0.044   |           |
| Yes                                   | 69 (82)                       | 42 (67.7)                       | 111 (76) |           |
| No                                    | 15 (18)                       | 20 (32.3)                       | 35 (24)  |           |
| Pre-FURS Ureteric stent              |                               |                                 | 0.492   |           |
| Yes                                   | 4 (4.8)                       | 2 (3.2)                         | 6 (4)    |           |
| No                                    | 80 (95.2)                     | 60 (96.8)                       | 140 (96) |           |
| Preoperative Urine Culture:          |                               |                                 | 0.331   |           |
| Yes                                   | 65 (77.4)                     | 52 (84)                         | 117 (80) |           |
| No                                    | 19 (22.6)                     | 10 (16)                         | 29 (20)  |           |
| Type of FURS:                         |                               |                                 | 0.287   |           |
| Digital                               | 28 (33.3)                     | 26 (42)                         | 54 (37)  |           |
| Fiberoptic                            | 56 (66.7)                     | 36 (58)                         | 92 (63)  |           |
| Use of Safety Guidewire:             |                               |                                 | 0.312   |           |
| No                                    | 5 (6)                         | 8 (13)                          | 13 (9)   |           |
| In some cases                         | 22 (26)                       | 17 (27.3)                       | 39 (26.6)|           |
| In all cases                          | 57 (68)                       | 37 (59.7)                       | 94 (64.4)|           |
| Ureteral Access Sheath                |                               |                                 | 0.516   |           |
| Yes                                   | 52 (62)                       | 43 (69.4)                       | 95 (65)  |           |
| No                                    | 3 (3.5)                       | 3 (4.8)                         | 6 (4.2)  |           |
| In prestented cases                   | 29 (34.5%)                    | 16 (25.8)                       | 45 (30.8)|           |
| Laser Lithotripsy                     |                               |                                 | 0.031   |           |
| Dusting                               | 53 (63)                       | 28 (45.2)                       | 81 (55.5)|           |
| Fragmentation                         | 31 (37)                       | 34 (54.8)                       | 65 (44.5)|           |
| Fragments retrieval                   |                               |                                 | 0.485   |           |
| No Retrieval                          | 22 (26.2)                     | 12 (19.4)                       | 34 (23.3)|           |
| Basket                                | 56 (66.7)                     | 47 (75.8)                       | 103 (70.5)|           |
| Forceps                               | 6 (7.1)                       | 3 (4.8)                         | 9 (6.2)  |           |
| Postoperative Stent                   |                               |                                 | 0.539   |           |
| All cases                             | 49 (58.3)                     | 33 (53.2)                       | 82 (56.2)|           |
| Indicated cases                       | 35 (41.7)                     | 29 (46.8)                       | 64 (43.8)|           |
| Period of stenting after ureteric injury: |                           |                                 | 0.042   |           |
| 2 Weeks                               | 12 (14.3)                     | 12 (19.4)                       | 24 (16.5)|           |
| 4 weeks                               | 52 (62)                       | 45 (72.6)                       | 97 (66.5)|           |
| 6 weeks                               | 20 (23.7)                     | 5 (8)                           | 25 (17)  |           |
The second important difference was the preference of semirigid URS for treatment of upper ureteric calculi. Although high-volume endourologists used semirigid URS less frequently than low-volume group (68% vs 82%, \(P = 0.044\)). However, a considerable number of endourologists in each group preferred semirigid URS for treatment of upper ureteric stones. This may be attributed to financial causes in some countries, less experience in using FURS by some urologists (especially in low-volume group) or choosing to start with semirigid URS and if stone fragments escaped to the kidney, FURS can be used to retrieve them. AUA guidelines recommended that a FURS should be available when performing URS for proximal ureteric calculi [3]. Galal et al. and Karadag et al. compared both techniques for treatment of proximal ureteric calculi and reported that FURS offered significantly better stone free rate (\(P = 0.005\)) but rigid URS had significantly shorter operative time (\(P = 0.005\)) and both had comparable complication rates [9, 10].

The third difference in this survey was utilization of Laser dusting of stones by more endourologists in low-volume group (63% vs 45%, \(P = 0.031\)). High-volume endourologists prefer fragmentation and stones retrieval to achieve immediate stone free status in most patients, while low-volume surgeons prefer dusting and leaving gravels for spontaneous passage. Dusting uses low energy, high-frequency and long pulse duration setting to fragment stones into fine powder and small fragments that are left for spontaneous passage [11]. The stone free rates for fragmentation and basket retrieval were significantly better than dusting, but operative time was shorter for dusting [12, 13].

The use of UAS with FURS has been a controversial issue in urological literature. Advantages of UAS include ease of multiple passages of the scope, rapid stone extraction, higher stone free rates, low intrarenal pressure during prolonged procedures [14, 15]. Other reports showed no advantages of UAS for stone free rate or operative time, while the incidence of complications was higher with UAS [16, 17]. In the present survey, the use of UAS was practiced by 62 and 69% of responders in group 1 and 2 respectively (\(P = 0.516\)). It is obvious that about two thirds of endourologists of different levels of case load believe that the advantages of UAS outweigh its disadvantages. A similar result was reported from a large European survey where 70.7% used UAS [7].

When asking about the use of a safety guidewire, 68% of group 1 and 60% of group 2 indicated that they used it in all cases. In the past, use of a safety guidewire was highly advised to allow smooth access to the pelvicalyceal system and facilitates ureteral stent placement in case of ureteral or collecting system injury [18]. A study by Western Endourological stone consortium showed that the risks for FURS damage were significantly decreased when using a safety guidewire [19]. Currently, and with increased use of UAS; there are some reports of FURS without a safety guidewire [20, 21]. In the present study, it was observed that 13% of high-volume surgeons did not use a safety guidewire compared to 6% of the other group. These rates are more than the reported 1.9% in the previous survey by Dauw et al. [6] and we think that it is expected to increase in future.

Another controversial issue is the placement of ureteric stent either before or after FURS. The present survey showed that the majority endourologists in both groups follow the AUA guidelines in omitting ureteral stent placement prior to FURS. For post-FURS stenting, the AUA guidelines recommended ureteric stent placement in certain indications such as ureteral injury, ureteric stricture, large stone size, incomplete stone fragmentation, solitary kidney or impaired renal function [3]. However, in the present survey 58% of group 1 and 53% of group 2 placed a stent in all cases after FURS. These rates are comparable to previously reported 64% by Dauw et al. [6] and slightly more than the 44% reported in the European survey [7].

Low response rate (12%) in comparison with 20% in Dauw et al. survey among Endourology Society members [6] was the major limitation of the present study. However, responders represented all regions around the world. This survey included specific group of urologists who are interested in endourology as primary subspecialty. Therefore, the results cannot be extrapolated to general urologists. On the other hand, this study showed the differences in clinical practice of FURS among endourologists of low versus high-case volume. This is highly valuable to know the current controversies, agreement or disagreements with international guidelines. The future implications include conducting randomized controlled studies to compare the safety and efficacy of controversial issues involving FURS indications, instruments and clinical practice.

Conclusions
The use of FURS for treating upper tract calculi has expanded by high-volume endourologists to include large renal stones > 20 mm. Low-volume surgeons prefer to use semi-rigid URS for treatment of upper ureteral stones, to apply Laser stone dusting and maintain ureteral stents for longer periods. Ureteral access sheath is commonly used whatever the case-volume per year.

Abbreviations
AUA: American Urological Association; EAU: European Association of Urology; FURS: Flexible ureteroscopy; FCNL: Percutaneous nephrolithotomy; UAS: Ureteral access sheath; URS: Ureteroscopy

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Authors' contributions
OA: Design of the work, AAA: Acquisition of data and drafting the manuscript, ARE: Interpretation of data and drafting the manuscript, BA: Analysis of the data, AA: Acquisition and analysis of data, FA: Acquisition and analysis of data, ME: Study conception. All authors read and approved the final manuscript.

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Availability of data and materials
All data are available for review on request.

Ethics approval and consent to participate
No ethical approval was needed because there were no patients included in this anonymous internet survey. By accepting the invitation to complete the online survey, all participants provided their informed consent to take part in the study.

Consent for publication
Not applicable.

Competing interests
The author Ahmed R. El-Nahas is a member of the editorial board (Associate Editor) of this journal. All other authors declare that there are no competing conflict of interests.

Author details
1Urology Department, Al-Amiri hospital, Kuwait City, Kuwait. 2Urology Department, Adan hospital, Hadiya, Kuwait. 3Urology and Nephrology Center, Mansoura University, Mansoura, Egypt. 4Urology Department, Al-Farwaniya hospital, Sabah Al Nasser, Kuwait. 5Urology Department, Menoufia University, Al Minufya, Egypt.

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