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Can endourology fellowship training enhance minimally invasive surgery in urology practice?

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KEYWORDS

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ABBREVIATIONS

EFTS, endourology fellowship trained member of staff;
URS, ureteroscopy;
PCNL, percutaneous nephrolithotomy;
HOL(EP), holmium laser (enucleation of the prostate)

Abstract ***Objective:*** To evaluate the influence of fellowship training in endourology on different endourological procedures in a single institution.

Subjects and methods: The operative records of endourological and open surgeries were reviewed. Data analysed included numbers, types, and technical issues related to surgeries. The early study period ranged from September 1998 to September 2004, and the later period from January 2014 to June 2016. The study duration was classified into three periods according to the availability of an endourology fellowship trained member of staff (EFTS). In period A (September 1998 to September 2001) no EFTS was available, in period B (October 2001 to September 2004) an EFTS joined the urology unit, and in period C (January 2014 to June-2016) the EFTS had left the urology unit.

Results: In periods B and C the number of rigid ureteroscopy (URS) significantly increased compared with period A. Also, flexible URS was used for the first time in period B and continued in period C. The number of percutaneous nephrolithotomies increased in period B and continued to be performed in period C. Laparoscopic urological surgery was not undertaken in period A, and only done in four cases in

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period C, whilst it was performed in 62 patients in period B. Holmium laser enucleation of the prostate was carried out in 36 patients during period B and not performed in periods A and C. Finally, the number of open stone surgeries decreased in periods B and C.

Conclusion: The introduction of an EFTS definitely enhanced the practice of minimally invasive procedures.

Introduction

Over the past 50 years surgical specialties have been revolutionised by endoscopically based techniques. The collaboration of Harold H. Hopkins, Karl Storz and George Berci in the technology and design of endoscopic equipment facilitated the growth endoscopic surgery, which was recognised by the *Journal of Urology* as a 'milestone in urology' leading to the field known as 'Endourology' [1]. Endourology has since become an established subspecialty in urology. The terminology was popularised by pioneers who founded the Endourological Society in 1984 [1]. This subspecialty utilises most of the advanced technology in urology including ureteroscopy (URS), percutaneous renal surgery, laparoscopy, laser technology, shockwave lithotripsy, and recently robot-assisted surgery. Many centres worldwide have moved away from open surgery to minimally invasive procedures.

To develop this subspecialty further, the Endourological Society has recognised and initiated fellowship programmes to improve the level of practice of this technology dependent field of urology. To the best of our knowledge, the present study is unique in assessing the effect of fellowship training in endourology on urology practice. In the present study, we reviewed the effects of an endourology fellowship trained member of staff (EFTS; A.M.A.) joining the urology unit on the change in urology practice, especially on the numbers, types, and technical issues of minimally invasive surgeries in a single institution in Kuwait.

Subjects and methods

The operative records of endourological and open surgeries were reviewed in a single institution with 600 beds. The review included the number, types, and technical issues related to surgeries. The study was divided into three periods: period A, early stage (September 1998 to September 2001); period B (October 2001 to September 2004); and period C, late stage (January 2014 to June 2016). This was according to the availability of an EFTS in the department. In period A, and C the EFTS was not available, whilst in period B the EFTS was available. The EFTS (A.M.A.) had completed a residency training programme in Canada followed by a 1-year clinical endourology fellowship in the USA. The EFTS had the following minimally invasive procedures in his log per year during his fellowship: 160 percutaneous nephrolithotomies (PCNLs), 135 rigid URS, 22 flexible URS, and 44 laparoscopic urological surgeries.

With regard to the single institution where the study was done, in period A, the urology unit comprised nine members including two consultants, five specialists, and two residents. In period B the number of staff was 10 including two consultants, five specialists, and three residents, whilst in period C, there were 16 staff members, including two consultants, seven specialists, and seven residents. The unit had two operative days per week and two operating rooms available on each day.

The three study periods were compared for the number and indications of different endourological procedures, and technical issues. This included the number of rigid and flexible URS, the type of intracorporeal lithotripsy machine used with URS. Furthermore, the number of PCNLs and endopyelotomies was assessed. The number of laparoscopic urological surgeries and the use of holmium laser (HOL) for transurethral enucleation of the prostate (HOLEP) were also recorded. Finally, the number and indications of open surgery for treatment of stone disease were recorded in the study periods.

Results

Table 1 summarises the types and number of endourological procedures performed in the three studied periods. Rigid URS was the most frequent endourological technique. It was conducted in 110 patients with ureteric stones in period A. During this period, a large calibre URS (10, 11, 12 F) with no camera was used and hydrophilic guidewires were not available. The vast majority of the stones (87%) were located in the pelvic part of the ureter (Table 2). Big stones were fragmented with a LithoClast device, whilst fragments and smaller stones were extracted with a basket and/or forceps. A HOL was not used in disintegration of ureteric stones in this period and flexible URS was not available.

A marked improvement in the technique of URS was seen during period B and continued in period C. Table 2

Table 1 The types and number of endourological procedures in the three study periods.

Procedure	Period A	Period B	Period C	P^*
Rigid URS	110	264	293	< 0.005
Flexible URS	0	12	32	< 0.005
PCNL	4	143	62	< 0.005
Endopyelotomy	0	26	0	< 0.005
Laparoscopy	0	62	4	< 0.005
HOLEP	0	36	0	< 0.005

* Chi-squared test.

Table 2 The differences in the technique of URS between the three study periods.

Variable	Period A	Period B	Period C
Size of rigid URS, F	10, 11, 12	7, 8.5, 9	7, 8.5, 9
Use of camera	No	Yes	Yes
Use of hydrophilic guidewire	No	Yes	Yes
Use of HOL for lithotripsy	No	Yes	Yes
Use of flexible URS	No	Yes	Yes

summarises the differences in the technique of URS between the three study periods. Smaller rigid URS (7, 8.5, 9 F) was used with a camera and hydrophilic guidewires in periods B and C. The number of rigid URS performed for treatment of ureteric stones increased 2.5-fold when compared with period A (Table 1), and increased further in period C. Moreover, the percentage of proximal ureteric stones treated in period B significantly increased when compared to period A (Table 3). A HOL was also added to the LithoClast machine for disintegration of bigger stones in periods B and C. In addition, flexible URS was used for treatment of proximal ureteric stones in 12 patients in period B and increased to 32 in period C. Finally, the indications of URS were extended in period B to include the use of flexible URS in the diagnosis of the cause of haematuria of the upper urinary tract, which continued in period C. In period A, PCNL was performed in only four patients using a staged technique. Whilst, in period B, the number of PCNL procedures dramatically increased up to 143 and these were performed in one stage and continued to be performed in period C but decreased in number to 62. In addition, 26 endopyelotomy procedures were carried out in period B, but no cases of endopyelotomy were performed in periods A and C.

Table 3 Locations of ureteric stones treated by rigid URS in the two study periods.

Stone location	Period A, *n* (%)	Period B, *n* (%)	P^*
Pelvic	96 (87)	183 (69.3)	< 0.001
Iliac	11 (10)	46 (17.4)	
Lumbar	3 (3)	35 (13.3)	

* Chi-squared test.

Laparoscopic urological surgery was never carried out in period A, whilst it was performed in 62 patients in period B, and used in only four cases in period C where they were performed over a short period with a visiting urologist from outside the country. The types of laparoscopic urological procedures performed in period B are detailed in Table 4.

HOLEP was carried out in 36 patients during period B, whilst this procedure was never done in periods A and C. Finally, the number of patients who had open surgery for treatment of urolithiasis dramatically decreased from 34 patients in period A to only two in period B and four in period C. The detailed results of the various endourological procedures are beyond the scope of the present study. Nevertheless, the overall success, failure, and complication rates were comparable to those of previous similar studies.

Discussion

The field of endourology, which encompasses genitourinary endoscopy, percutaneous, laparoscopic, and robot-assisted surgery, has advanced rapidly over the past 25 years, such that endourology is now considered a subspecialty of urology.

The Endourological Society, which is recognised by the AUA, offers numerous clinical and research fellowship opportunities throughout the world [2]. Fellowship training, especially in minimal invasive surgery/endourology, has become considerably more common [3]. Since the development of the Endourological Society

Table 4 The types of laparoscopic urological procedures performed in period B.

Procedure	No. patients (%)
Radical nephrectomy	5 (8.1)
Simple nephrectomy	8 (12.9)
Ureterolithotomy	6 (9.7)
De-roofing of simple renal cyst	8 (12.9)
Diagnosis and treatment of undescended testes	10 (16.1)
Excision of bladder diverticulum	1 (1.6)
Varicocelectomy	24 (38.7)

in 1984 and the implementation of many fellowship programmes for training in this important subspecialty, more urologists are attaining this specialisation. Endourology practice has led to increasing use of different less invasive procedures such as PCNL, URS, and laparoscopy, where they have replaced open surgery.

Endourology has rapidly gained worldwide acceptance and transformed the diagnostic and therapeutic approach to benign and malignant diseases of the entire urinary tract. According to a questionnaire completed by 155 urologists across the USA, there was a correlation between fellowship training in laparoscopy/endourology and using laparoscopy as the primary surgeon [4]. The propensity for open surgery is dramatically decreased when endourology training has taken place through endourology fellowships approved by the Endourological Society, which are designed to provide adequate exposure to different minimally invasive procedures.

The present study is the first, to our knowledge, that has reviewed the effects of endourology fellowship training in changing urology practice towards minimally invasive surgery in a single institution.

In the present study, it is clear that the number of minimally invasive procedures and the use of new technology significantly increased during the period coincident with availability of an EFTS. Although some of the newer and more advanced technology became more readily available during the time frame of this study, the technology used by the EFTS was readily available worldwide in period A before his arrival. Therefore, the natural evolution of technology had no impact on the results of the present study.

An example of the effect of endourology fellowship training is the increase in the number and improvement in the technique of PCNL with the availability of an EFTS. In a survey study, most Endourological Society members performing PCNLs who responded to obtain their own access, and there was a higher proportion of self-obtained access in fellowship-trained endourologists, confirming the effect on fellowship training in improving the skills of PCNL access [5].

Although clinical endourology fellowship opportunities may not be available to all interested urologists, we suggest that one may consider attending conferences and courses, especially with live surgery and hands on training. Some of the alternative methods of acquiring new skills or mastering new technology include the use of a mini-fellowship, mentoring programmes, and virtual reality simulators. Also on-site invitation of experts is another helpful alternative to improve the operative skills in this highly technical subspecialty. We have used live case demonstrations (LCDs) to teach others minimally invasive surgery. Salami et al. [6] have shown that LCDs are perceived to be an effective mode of education by performers and moderators.

An example of transfer of laparoscopic surgical skills was observed in hand-assisted laparoscopic nephrectomy when an experienced surgeon moved to another centre where this influenced the trainee experience [7]. Endourology fellowships currently provide a greater exposure to laparoscopy and robotics than the Society of Urologic Oncology (SUO) fellowships [8]. This attests the effect that we observed in our present study, where laparoscopic urological surgery was initiated when an EFTS joined the unit but continued to be less used after the EFTS left.

Kommu et al. [9] reported that no study has documented a global consensus on optimal laparoscopic urological training programmes. Their search identified several models, some of which were applied successfully in the form of mini-fellowships.

Endourology training fellowships appear to be important, as graduating residents across the world, particularly in Europe, complain of a deficiency in endourology experience during their residency [10]. Nevertheless, the bigger question is how to train practitioners who are already in practice? In our centre the endourology areas of interest were general, as we are located in a general community hospital, whilst in other centres across the world specialisation is possible to encompass stone treatment, standard laparoscopy and robot-assisted surgery.

Fellowship-trained endourologists who work in an academic setting are more likely to have a subspecialised practice. A subset of private practice endourologists also have focused practices in benign disease, whilst the traditional fellowship model will be useful for some graduates, subspecialised tracks may improve the efficiency of the training model [11].

Finally, to improve the practice of urology including endourology, better emphasis on residency training is required. A structured and well-organised training programme might attract additional medical students towards urology and contribute significantly to the further development of the specialty [12], which would be further enhanced by endourology fellowship training.

As stated earlier the present study clearly shows the advantage of endourology fellowship training in applications of minimally invasive urological surgeries, which are becoming the standard of care for many conditions.

Conclusion

Endourology experience needs special training that can be obtained easily through the currently available worldwide endourology fellowship programmes. This important experience had a significant effect in changing the urology practice in our institution, not only on the number, but also on the types of the endourological procedures performed. Emphasis on training evaluation in

urology should continue to evolve for better patient outcomes.

Conflicts of interest

None.

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