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UROLOGY

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INSIDE

Review of

ENDOUROLOGY 2015

Antalya, Turkey

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UROLOGY

Editorial Board

Welcome

Hello and a very warm welcome to another fascinating edition of *European Medical Journal Urology* – your trusted source for all of the latest innovations and discoveries in the urological field. Our editorial team has been working tirelessly to bring you an in-depth review of one of the most important events on any urologist's calendar: the 11th National Endourology Congress. The EMJ team were there in Antalya, Turkey, and our expansive report, brought to you straight from the congress floor, will serve as the perfect refresher for those lucky enough to be there, and an invaluable resource for those unable to attend.

As well as our comprehensive review, which covers all of the major news and developments from the event, you will find a wealth of peer-reviewed scientific articles from some of the most prominent delegates, hand-picked for their relevance from the diverse scientific programme. Undoubtedly, one of the most relevant hot topics in endourology today is robotic-assisted surgery, which has emerged quickly in recent years to become an essential component in many urological procedures. With that in mind, our Editor-in-Chief the esteemed Dr A. Erdem Canda has co-authored two articles on the subject: the first detailing the outcomes of transperitoneal robotic adrenalectomy procedures, and the second reporting the outcomes of robotic radical prostatectomy in high-risk prostate cancer patients. In addition, Alkan et al. have penned an article on flexible ureteroscopy and laser lithotripsy for the management of urinary calculi in patients with congenital abnormalities of the kidney and ureter, while Tavukçu et al. debate the efficacy and utilisation of preoperative magnetic resonance imaging in robotic-assisted radical prostatectomy.

The 11th National Endourology Congress 2015 was a momentous occasion, and surely a high watermark for an ever-evolving area of modern medicine. It is our hope that the trend of betterment in the field that was evident at the Congress can continue and, for those reading this eJournal, that some semblance of the innovation we witnessed first-hand in Antalya can be passed on to you in order to positively influence your practice and the health of your patients. Thank you for reading, and all the best for the remainder of the year.

Spencer Gore

Team Principal, European Medical Journal

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EMJ GORELY NEW MEDIA

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Foreword

Dr A. Erdem Canda

Associate Professor of Urology,
Yildirim Beyazit University, Ankara, Turkey

Dear Colleagues and Friends,

It is a great pleasure for me to introduce you to the summer issue of the *European Medical Journal Urology.*

This issue focuses on the 11th National Endourology Congress that was held on 23rd-26th April 2015 in Antalya, Turkey. The beautiful Mardan Palace Hotel located near to the sea on the southern coast proved to be an idyllic backdrop, with many attendees taking full advantage of the wonderful sights and attractions on offer.

> "Endourology is undoubtedly the most rapidly evolving area in the field of urology, and the area most heavily influenced by the non-medical sciences. As such, this congress was always going to be a highly anticipated event for medical professionals attending from across the globe."

During the congress, a large number of the most essential topics within this dynamic field were discussed and analysed, particularly endourologic management of urinary tract stone diseases, laparoscopic and robotic urology, bladder cancer and endourologic management, upper urinary tract urothelial cell carcinoma and endoscopic management, nephrectomy by laparoendoscopic single-site surgery and natural orifice transendoluminal surgery, reconstructive urology, and paediatric endourology. This broad coverage enabled those present to gain a thorough understanding of the latest advances through a stimulating range of formats such as poster, oral, and video presentations, as well as challenging and interesting case discussions.

Delegates were also treated to courses in laparoscopy, percutaneous nephrolithotomy, and retrograde intrarenal surgery, as well as a European Training in Basic Laparoscopic Urological Skills workshop and exam, all of which attracted great interest.

Endourology is undoubtedly the most rapidly evolving area in the field of urology, and the area most heavily influenced by the non-medical sciences. As such, this congress was always going to be a highly anticipated event for medical professionals attending from across the globe. They certainly did not leave disappointed!

I hope you enjoy reading the latest issue.

Yours sincerely,

A. Erdem Canda

Associate Professor of Urology, Department of Urology, School of Medicine, Yildirim Beyazit University, Ankara Ataturk Training and Research Hospital, Ankara, Turkey.

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Exclusive Interviews from the 11th National Endourology Congress 2015

(Click on video clip to view)

Abhay Rane, OBE MS FRCS FRCS(Urol)
Professor, Urology
East Surrey Hospital, Redhill, United Kingdom

An Interview with Dr Abhay Rane at the 11th National Endourology Congress, Discussing the Key Points of the Upcoming World Congress of Endourology

Abolfazl Hosseini, M.D.
Urology, Karolinsk Unviersity Hospital,
Stockholm, Sweden

An Interview with Dr Abolfazl Hosseini at the 11th National Endourology Congress, Discussing the Developing Treatment in Bladder Cancer

John Warren Davis, M.D., F.A.C.S.
Associate Professor, Urology Director,
Urosurgical Prostate Cancer Program, M.D. Anderson Cancer Centre,
Houston, Texas, USA

An Interview with Dr John Warren Davis at the 11th National Endourology Congress, Discussing the Key Points from the Congress

Kevin C. Zorn, MD, FRCSC, FACS
Director of Robotic Surgery, Assistant Professor,
Department of Urology, University of Montreal,
Montreal, Canada

An Interview with Dr Kevin C. Zorn at the 11th National Endourology Congress, Discussing Developments within the Field

Dr A. Erdem Canda Chairs a Discussion on the Trends and Developments in the Field of Endourology

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NATIONAL ENDOUROLOGY CONGRESS 2015

MARDAN PALACE,
ANTALYA, TURKEY
23RD-26TH APRIL

Welcome to the *European Medical Journal* review of the 11th National Endourology Congress 2015

From the 23rd-26th April 2015, the 11th edition of the biennial National Endourology Congress welcomed more than 500 delegates to present, learn, and debate the most up-front topics in this rapidly evolving branch of urology. This national meeting continues to grow with each edition and the full programme of international speakers now attracts physicians not only from all over Turkey, but also from neighbouring countries, as well as Azerbaijan, Iran, Russia, and the Balkan nations. Those who attended the congress were rewarded not only with a comprehensive scientific programme addressing almost every area of endourology, but also with the opportunity to experience all of this in the incredible setting of the Mardan Palace on the southern coast of the region of Antalya.

The congress opened with speeches from a host of national dignitaries, including the Congress President, the President of the National Endourology Society, the President of the Turkish Urology Association, and Prof Eyüp Gümüş, Undersecretary at the Turkish Ministry of Health, who described the Turkish government's plans to expand its healthcare sector and reminded everyone that the congress coincided with the International April 23rd Children's Festival first established as a national event

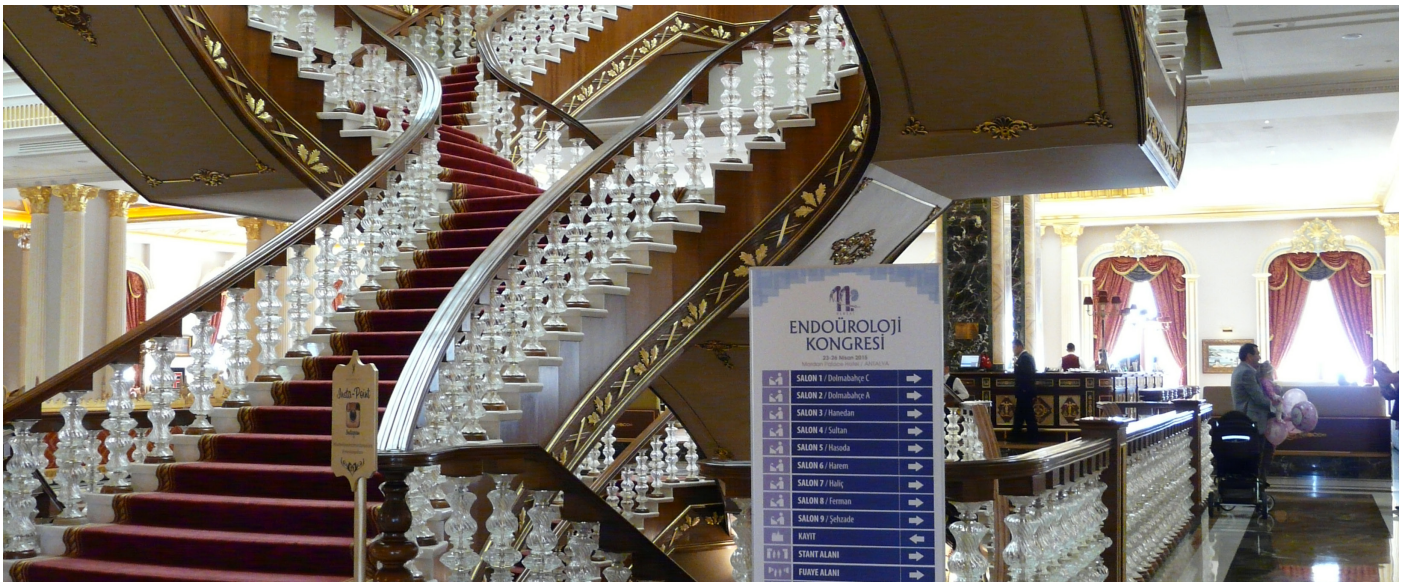
in 1920. Prof Gümüş summarised his hopes for the festival and the congress: "I hope that this day brings good things to all of us, and I hope that all the youngsters will be healthy in the future. Of course, with these congresses there is a great exchange of experiences and ideas, and, in health, it is with these scientific activities that practitioners increase their skills."

The opening speeches were followed by the keynote 'EAU Lecture' presented by Prof Dr Bob Djavan from the University of Vienna and New York University. The rest of the first day's programme was entirely devoted to the treatment of urological stone disease, but closed with a special session hosted by Prof Gümüş and Mr Fatih Tan, Deputy Director of the Turkish Medicine and Medical Device Agency, which aimed to address the specific challenges involved in the regulation of endourology practice. The end of each day was rounded off with a series of oral and video presentations of research abstracts submitted to the congress.

The morning of the second day, and each morning for the rest of the event, provided delegates with the opportunity to interact and improve their specialist knowledge by participating in courses on percutaneous nephrolithotomy, retrograde intrarenal surgery, and laparoscopic urology. The presentations on the second day were organised into the themes of robotic laparoscopy, prostate cancer, and bladder cancer, whereas the third day addressed endourological kidney surgery and new horizons for endourological techniques. The afternoons of the second and third days were given over to sessions co-hosted between Turkish specialists and their expert colleagues from Iran and Azerbaijan.

The full scientific programme, combined with the spectacular views of the Mediterranean, left a lasting impression on all delegates lucky enough to attend and there is no doubt that there will be plenty of new developments in the field for everyone to discuss at the next edition of the congress, which is to be held in 2 years' time.

"Of course, with these congresses there is a great exchange of experiences and ideas, and, in health, it is with these scientific activities that practitioners increase their skills."



Interview with Dr Abolfazl Hosseini, Department of Urology, Karolinska University Hospital, Stockholm, Sweden

Robots are set to revolutionise laparoscopic surgery and take endourology to brave new heights

The 11th National Endourological Congress in Antalya, Turkey, held from 23rd-26th April 2015, unfolded against the backdrop of the stunning Mardan Palace, with many of the world's leading minds in the field of endourology gathered to discuss their crucial new findings in a range of therapeutic areas. During this event, EMJ had the chance to talk to Dr Abolfazl Hosseini, a preeminent purveyor of totally intracorporeal robotic-assisted radical cystectomy (RARC), who had much to say about his experiences in a rapidly evolving area of urology as well as his involvement at the congress.

Dr Hosseini began with a personal tribute to the congress, stating his admiration for the structure and personnel that ensured a healthy networking environment for attending endourologists. "I think that the greatest part of this congress [...] is the social part, who you meet the new colleagues that can establish a new way to co-operate in any way, especially in a scientific way," he said. "I really appreciate being here, it is my first visit here and I hope that I can come back again."

With a specialist interest in pelvic oncology at Karolinska University Hospital, Dr Hosseini earned his PhD from Karolinska Institutet in 1999, and has become a world leader in totally intracorporeal RARC. Exceptionally well trained in robotics, Dr Hosseini has overseen the development of numerous surgeons in the fields of both robotic cystectomy and robotic prostatectomy, and has been truly instrumental in the establishment of robotic surgery services across Europe and Asia.

Exposed to a spectrum of endourological sessions at the congress in Antalya, Dr Hosseini learned much from the presentations and felt that he has received an education in areas of endourology to which he had had little prior exposure. "The congress was a combination of endourology, laparoscopic, and robotic surgery. For me that is maybe my best domain, part of my work is robotic surgery," he explained. "I see a lot of laparoscopic surgery here, I even saw an endourology laparoscopic procedure, which is new knowledge that I can take with me to Stockholm."

"I think that the greatest part of this congress [...] is the social part, that you meet the new colleagues who can establish a new way to co-operate in any way, especially in a scientific way."

Having worked for 20 years in the field of bladder cancer (BLC), Dr Hosseini has specialised in BLC surgery since he was awarded his PhD, and he explained the performance of the robotics system at Karolinska, a world leading institution for robotic-assisted surgery (RAS), as well as his own view of how the BLC treatment scene has evolved over the years. "When we started the open surgery in 2003 at Karolinska, we started the robotic surgery and until now we have done more than 300 cases in the robotics sector, and now Karolinska is maybe the biggest centre in Europe and maybe the world for doing this intracorporeal approach. We can take out the bladder, the cystectomy is done," Dr Hosseini said. "The challenging part is to make the diversion, and the diversion when you use the intracorporeal approach is the more challenging part. It is a demanding and time-demanding procedure. We have done this procedure from the beginning, and I am proud to tell you that as a centre we produce very high-quality data."

The introduction of robotics in endourological surgery has not only helped Dr Hosseini to perform his own work but has also bolstered his ability to train less experienced surgeons. He described how the development of remote surgery, which allows the doctor to perform surgery on a patient even if they are not physically in the same location, has made it possible for urologists to use robotics such as the da Vinci® Surgical System to complete an operation occurring anywhere in the world from the comfort of their own institute. The advance has allowed Dr Hosseini to instruct clinicians who are performing surgery no matter what the physical distance may be. "I could sit here in Antalya and train somebody or lead somebody in Stockholm, for example," said Dr Hosseini. "This is the most advantageous part of this procedure." A particular

accomplishment in this field for Dr Hosseini was the completion of ten international liver surgery sessions across a 24-hour period, with sessions occurring in countries including the USA, Australia, and India. Such an ambitious project would not have been possible in the days before robots entered endourology.

When asked for his thoughts on what makes a medical journal an interesting and educational read, Dr Hosseini suggested a concise and selective approach to medical reporting in order to attract readers. "I think that you can shortly define the congress in general, with a small report of maybe every session. You can describe the quality of the congress, what the congress is talking about, and what the aim of the congress is; not too much description because I think everyone would like to read just short text, effective, and it should be of great benefit," said Dr Hosseini.

Dr Hosseini had also given a talk on robotic vasectomy at the congress, in a session involving the Iranian Urological Association and the Turkish Association of Urology; being Iranian himself, Dr Hosseini has a strong connection with the former. Having contributed immeasurably to the field of RAS, the whole world now looks to further prosper from Dr Hosseini's continued input, as the mechanisms of surgery are constantly progressed to the benefit of patients and clinicians worldwide.

For the full interview click here.

Interview with Prof Abhay Rane, Consultant Urological Surgeon, Surrey and Sussex NHS Trust, East Surrey Hospital, and Spire Gatwick Park Hospital, Surrey, UK

International collaboration is the key to moving endourology forward

Prof Abhay Rane, a distinguished endourologist renowned for his vital work in bringing laparoscopy to prominence within the UK, kindly agreed to meet EMJ for an interview at the 11th National Endourology Congress in Antalya, Turkey.

The congress, organised by the Turkish Endourological Society, is one that Prof Rane particularly enjoys coming to: "I find that they are very receptive as a group," he says. "They tend to work together and bring out the best of their teams, and I have also found that coming here is always a pleasure because they are amazingly gracious hosts."

The beautiful Mardan Palace, where this congress was held, proved an ideal setting in which Prof Rane could muse and discuss in detail his take on the world of endourology, and the ways in which the field could advance for the benefit of patients in the years to come.

"It is also a platform where most of our colleagues who practise endourology and laparoscopy are able to discuss what they have achieved to date and perhaps talk a little about what they are trying to achieve over the next few years."

Collaboration and a more unified approach among urologists and endourologists worldwide is certainly something that Prof Rane is a strong believer in, and which he feels can be much more easily achieved now thanks to the plethora of international endourological events that provide a platform for discussion and engagement across national borders. In this respect, Prof Rane talks positively about the 33rd World Congress of Endourology (WCE 2015) organised by the Endourological Society, of which Prof Rane is a very active member, to be held in London from 1st-4th October later this year. "This meeting brings together a number of like-minded individuals," he explains. "It also acts as a fulcrum to drive forward research into certain common areas that these individuals may choose to combine their interest in. It is also a platform where most of our colleagues who practise endourology and laparoscopy are able to discuss what they have achieved to date and perhaps talk a little about what they are trying to achieve over the next few years. We will also look at ways and means in which they can engage their colleagues from other countries in collaborative events and collaborative efforts to see whether they can come up with papers that have an international perspective rather than sticking to a national remit."

In addition, Prof Rane views such events as imperative for the fostering of relationships between endourologists, due to the unique networking opportunities available. "The fact is that it is a very successful meeting because of the networking that goes on, both behind the scenes and during the meeting itself," he says. "Because the meeting is tailored to endourology and laparoscopy, it is a meeting of like-minded individuals. As a result, they tend to come together much more easily because most of us who go for these endourology meetings know each other and there is a camaraderie that runs through endourologists in general. And because the meeting is not the size of a meeting like the American Urological Association with 15,000 or 20,000 attendees, it is, shall we say, 'big enough to matter and small enough to care', and that is why we find that the networking opportunities are much more pronounced and we find that we work together as a happy family."

But what does Prof Rane believe will be the major talking points of WCE 2015? He and his colleagues at the Endourological Society have decided upon three major themes that will form the basis of this

event: simulation, collaboration, and innovation. "There will be a number of cutting-edge topics of these three subjects, and we will hear the world's best proponents of these three topics talking about what, perhaps, they have done to date and where they are going with their research," he says. "All in all, it is going to be a very exciting time for endourology because we have to simulate nowadays in order to get better. The days of practising on live patients have now more or less gone because we have such good simulation models. We find that we can get the best out of people by collaborating in a number of endeavours whether they are educational, whether they relate to patient care, or even whether they relate to having projects that they can work on together across boundaries. And finally, innovation is something that we have been practising as urologists over centuries and it is nice to bring it all together under one umbrella."

Prof Rane certainly has the expertise required to help co-ordinate a more unified and innovative approach to improving treatment for urology patients. In 2014 he was awarded an OBE for his services to laparoscopic urology (his major specialty) and has taught laparoscopic skills to other consultants over many years, which has in turn enabled some hospitals in the UK to develop a local laparoscopic urology programme. His enthusiasm for the major advances in the field over recent times notwithstanding, Prof Rane is understandably optimistic about the future and sees endourology as an area which is only going to grow and develop. "When you talk about endourology, there have been several advances in instrumentation, in optics, in the way in which energy sources deliver energy to target areas," Prof Rane explains. "In robotics, there have been a number of new platforms that have been brought to clinical practice over the past 2-3 years, and I think it is just a question of time before we see more players coming into this arena and giving us even more technology, which will help drive what we want forward."

Indeed, it is improvements in laparoscopic and robotic surgery technologies that Prof Rane views as being among the next major developments in endourology. "I think it is miniaturisation of instrumentation. It is going to be the advent of laparoscopic techniques that are done with miniature instruments, with 3 mm instruments," he says. "There will be some focus on single-part technology, driven by robotic surgery." Overall, the future looks bright and patients with urological conditions can expect treatment options to improve over time, according to Prof Rane.

"The instrumentation that is used to visualise and treat tumours in the upper tract is getting better," he says. "The diagnostics are much better and therapeutic applications of certain drugs that we now have available are much more precise. So, all in all, I think we are moving forward to deliver patient care much more effectively."

As has been made clear by talking to Prof Rane, these types of improvements best take place when there is significant collaboration and the sharing of research and expertise among urologists, thus transcending national borders. Regular events such as WCE 2015 and the Turkish National Endourological Congress are the vehicles through which this type of co-operation can be driven forward at a faster pace.

For the full interview click here.

Interview with Dr John W. Davis, Associate Professor, Urology, Director, Urosurgical Prostate Cancer Program, M.D. Anderson Cancer Center, Houston, Texas, USA

During the 11th National Endourology Congress in Antalya, Turkey, we sat down with Dr John W. Davis, a highly renowned urologist and guest speaker at the event, to discuss both his own work and the status quo in the field of endourology.

Dr Davis explains that as a smaller event with a more focussed agenda the National Endourology Congress is a welcome change from some of the larger, busier meetings. "There are conferences where there are

multiple agendas going on at the same time, almost all hours of the day and night," he says. "You almost have to wear really good shoes because it is like a track meet getting from one place to the other." Indeed, the more intimate setting can provide many opportunities for networking with esteemed colleagues who might be otherwise engaged. "The international faculty gain a special bond because we listen to each other's talks, we have dinner together, and we have time to follow up and discuss things. Abhay Rane is here from the UK and the opportunity to sit with him for a while is more meaningful here in a smaller, international location," explains Dr Davis. "He is going to host the World Congress of Endourology in London in October and I will be there, but he is going to have a hundred people asking him and pulling him in different directions because that is his meeting."

Dr Davis presented a number of lectures on a range of topics during the congress. He describes the experience as being like "the other end of peer review," whereby all the latest findings are dissected and debated by the medical community in close proximity. But rather than be daunted by it, Dr Davis argues that this makes for a highly innovative and creative environment. "Often that is what goes on at smaller conferences. That is where you can actually show the highlights of key studies, or people show their personal data or surgical outcomes, and you try to blend all that together and decide what is impactful," he says. "When you do research, you want as many opportunities to present it and to explain it: you want it to have impact when it is finally published. You maybe want to have other critiques along the way, things that need to be fixed earlier rather than later." For many physicians, this is the predominant draw of such a meeting. "Some of this is scientific and some of it, actually, is networking. I would hate to say 'social' because that sounds like we are just having fun," jokes Dr Davis.

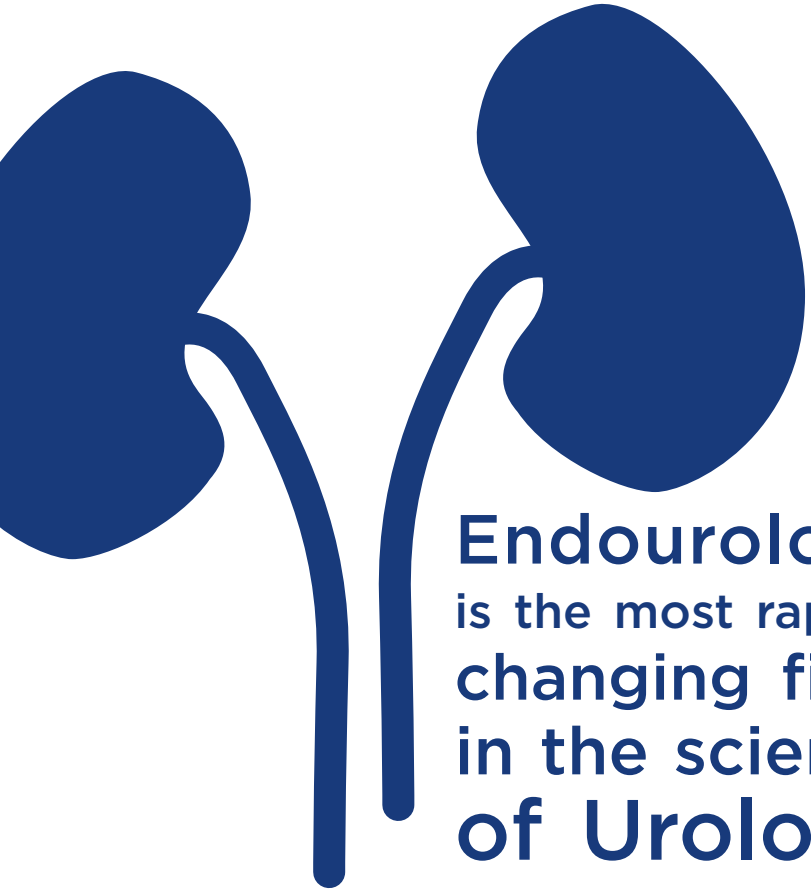
"Endourology meetings have a different flavour, they tend to be more about the evaluation of novel technologies, and to me it is a creative-thinking meeting."

For a physician based in Houston, Texas, getting the opportunity to travel overseas to medical conferences is invaluable. "I learn more from other surgeons in their own country versus a condensed 3-minute video," says Dr Davis. "I am in an academic practice where you are basically given a set period of time every year to try to develop your career. And sometimes that requires getting on a plane and going to another faraway place to see: 'What do they think?', 'What are they doing?' And the people of Antalya are highly accommodating of international delegates – there are always language-barrier challenges, but in general most of the Turkish physicians are well-rehearsed in English, much better than my Turkish," says Dr Davis.

In one of his presentations, Dr Davis advocated a multidisciplinary approach to urology, or "blended specialties". He argues that in order to be an effective physician one must be well versed in all aspects of the field: "A good endourologist needs to be a good oncologist," says Dr Davis. "My training 15 years ago

was structured to do both. I spent dedicated time in oncology, I spent dedicated time in endourology." Each subspecialty of urology has its own focus and this, says Dr Davis, is why attending varied congresses with different focusses is so important for practitioners. "Every congress has its own culture," he says, "endourology meetings have a different flavour, they tend to be more about the evaluation of novel technologies, and to me it is a creative-thinking meeting."

Dr Davis also spoke about the growing prevalence of robotic surgery and its impact on the field. "In prostatectomy in the US, [robotic surgery] is pretty much *the* technique now. If you are an outstanding open surgeon in the USA you could maintain a busy practice, but if you are a young urologist you pretty much *have* to master robotic surgery," he says.



Endourology is the most rapidly changing field in the science of Urology

In the last 10 years, the progress of change in robotic-assisted surgery has been quite substantial. Dr Davis describes the climate in 2003-4: "Attending surgeons were touching the robots for the first 100 cases, trainees were merely observing, and if you went into practice and had any exposure to the robot then you were considered an expert," he says. But he argues that much has changed since then: "If you fast-forward, in the 'prostate world' you cannot just have touched the robot, you had better have done a few hundred cases, so the bar is quite high."

The meteoric rise of robotic surgery has presented its own problems. "One of the things, and it is in robotics but it is also in other novel technologies, is how to put a price tag on cost or effectiveness," says Dr Davis. "For example, I just presented a novel imaging platform that visually, on the screen, looks fantastic, but it is really hard to show a benefit. It is not that expensive so maybe it is something that people can use while they are learning if they need help seeing the blood vessels, seeing the tumour, but a highly experienced surgeon can do that normally." This problem of proving the need for new technologies, especially in cases where they may merely provide assistance to physicians as opposed to having a direct impact on patients, is a common one, argues Dr Davis: "You see that repetitive theme with products that help with haemostasis, or help with ligating structures, things that assist a surgeon. So you are always trying to figure out how to balance cost and efficacy," he says. "So sometimes at these meetings, that is an opportunity to evaluate what people

are experiencing and sometimes people actually do figure out a way to save some money here and there with a novel trick."

Ultimately, however, a great advantage of this new technology is its growing, widespread standardisation across the world. "I have been lucky enough to do robotic surgery in many other countries and some of the hosts are still amazed that someone can just get off a plane," says Dr Davis. "But it is because it is the same system. Even with language barriers I can just go in and do an operation like it was in my own operating room. In the era 10 years ago, before robots, laparoscopy was common and there were major issues with standardised equipment and technique, and most travelling surgeons trying to do displays would bring their own team and their own instruments, because you could never trust what was going to be there for you. But here, the robot is the same in any country."

For the full interview click here.

Interview with Dr Kevin Zorn, Director of Robotic Surgery, Assistant Professor, Department of Urology, University of Montreal, Montreal, Quebec, Canada

Dr Kevin Zorn is one of the foremost leading surgeons in endourology and an expert in performing surgery with the da Vinci Surgical Robotic System. EMJ caught up with Dr Zorn at the 11th National Endourology Congress in April to talk about the congress and his opinions on the field of endourology.

"I think the nice factor about this conference is the camaraderie, the environment of free discussion, and sharing ideas on a multi-national level basis."

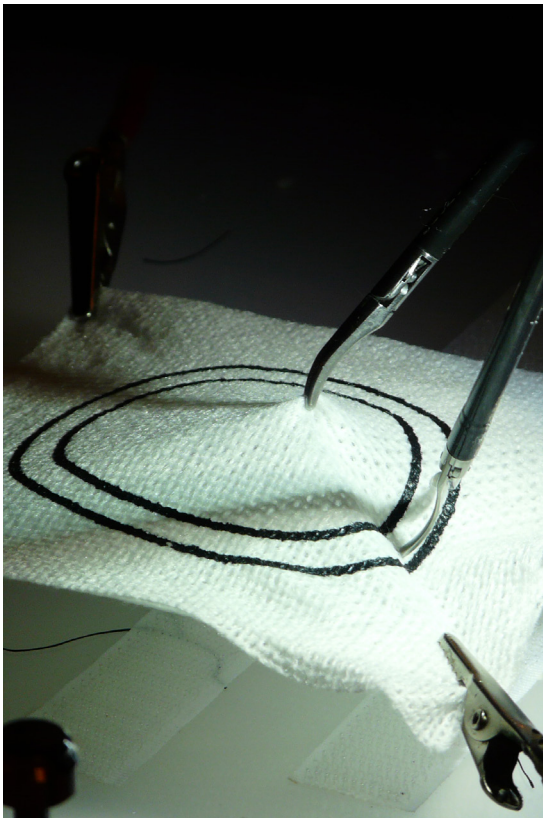
The congress was a triumph, and Dr Zorn expressed the benefits of having such an intimate setting for such an event, describing how many of the congresses that he attends are large-scale and impersonal. "I think the nice factor about this conference is the camaraderie, the environment of free discussion, and sharing ideas on a multi-national level basis," said Dr Zorn. "I think there is huge opportunity for international urologists who are unable to access technologies such as laparoscopy and robotics in their mid-career to get involved and learn these techniques and technologies."

The Endourology Congress is now in its 11th year, and its connected Applied Laparoscopic Training Course is nearing its 33rd year. The field of endourology is ever-growing, however this remains a relatively small conference. Dr Zorn noted the benefits of this: "I think with anything, more of a one-on-one nurturing environment and more direct contact with experts on skills-based surgeries is so needed. I think there are already so many large conferences that are just so vast and really it is nice to get some more from the lectures." Dr Zorn then suggested that given the sold-out attendance for past conferences, the Endourology Congress will do nothing but continue to grow.

Dr Zorn is based primarily in his home country Canada and the USA;

as a key speaker and joint host of previous conferences in Canada, EMJ asked if there were any recognisable differences between congresses in Europe and those in the USA. "I think there is a clear difference, in so far at least with my experience with the Turkish community, in their warmth and hospitality and all the attention to detail from location to the environment, to the audio visual, and to the translation," explained Dr Zorn.

Dr Zorn also noted and appreciated the willingness to teach, comparing the event's academic environment to that of a university. At the conference he sees teachers and pupils as equals, both learning new things, rather than seeing a 'teach and listen' experience. "It is not 'you are coming to university and this is how you do it' then 'please leave', there is that ongoing openness to work and collaborate."



The da Vinci Surgical Robotic System has been ground-breaking for endourology over the last few years, and Dr Zorn has been at the forefront of its rise. He described it as "a total game change. Fortunately it is all about timing and I started my fellowship just at the peak in that environment in Chicago where it just took over; we had a chairman who led the programme and globally, at the time, we were kind of the leaders in that." Dr Zorn worked closely with the system and recognises not only the advantages for patients being able to go home the day after surgery with minimal blood loss, cost advantages, and possible oncological advantage, but also an advantage for the surgeons themselves, noting that "my back, my shoulders, my elbows, my wrists all thank me today. No one really talks about that... we want to think of ourselves as uninjurable or we work through conditions as urologists when we are sick, so the robot allows that comfortable environment where you are not stressed, you are not under physical stress. I think that is a huge aspect that always gets kind of put under the rug, because you know surgeons are expendable; we do not really add that to the cost factor over a 20-30-year career."

Dr Zorn went on to describe how the da Vinci system has impacted on his training of residents and fellows. "For the first time ever we can record high-definition and replay, like sports players," he said. "You can go back and look - how did you do? What could we have done differently?" He went on to say that "the robot is simply a platform on which we can add ultrasonography CT [computed tomography]

imaging, overlaying of little arrows so we can on the second robot show the learner where to go and do this safely. So I think that robotic surgery by virtue of its rapid uptake globally amongst urologists is a true virtue of its assistance to us to do better surgery in a more ergonomic environment, and be a witness to surgery, to record and further learn from our mistakes."

EMJ asked Dr Zorn what he believed would be the next big thing in the field of endourology; he expressed interest and hope in the future. "We are hoping to see something interesting, game-changing I suppose. There is a lot of new stuff but it is not necessarily game-changing." However, he felt that "in urology it is like the stock market, I find there are ups and downs and I can think of the major changes in urology over the past 20 years, from the penile implants to the injectable penile caverjects, Viagra®, then to laparoscopic techniques and then robotics; I cannot really venture to say what the next big thing will be. I think that we will probably have some kind of image-based technology, and perhaps down the road even genetic treatments."

EMJ asked Dr Zorn what, if anything, he was taking away from the congress. He began by describing the biggest lessons that he would learn and take back with him from the congress. "The various other techniques in robotic surgery... I look forward to applying those and other collaborative research from just being here and working with some of the others on a few projects." He added: "I believe that the main take-home message is the ongoing growth of minimally invasive techniques. I think as urologists we are primarily interested in new technologies, and I think the clear message is that there are so many new instruments that adjunct to laparoscopy, robotics, and endourology, and I think that the key message at this meeting is that you never stop learning and there is always new stuff coming down the road."

For the full interview click here.

Round Table Interview with Prof Ali Taşçı, Prof Derya Balbay, Prof Fatih Atuğ, Dr Ali Serdar Gözen, and Dr A. Erdem Canda

At the end of April, whilst attending the 11th National Endourology Congress, EMJ met with a number of key experts in the field of endourology to discuss the latest developments in endourological surgery and to ask for their thoughts on a variety of issues currently affecting the practice of urinary medicine, such as the training of young residents and robotic surgery. Present at this meeting were leading specialists Prof Ali Taşçı, Prof Derya Balbay, Prof Fatih Atuğ, and Dr Ali Serdar Gözen; questions were both asked and translated by our Editor-in-Chief Dr A. Erdem Canda.

"We want Turkey to be a bridge between Asia and the Middle East and Europe and the USA [...] in order to build connections."

From left to right: Prof Derya Balbay, Dr A. Erdem Canda, Prof Ali Taşçı, Prof Fatih Atuğ, and Dr Ali Serdar Gözen.

Dr Canda asks Prof Ali Taşçı to discuss the development of Turkish endourology:

The Turkish Endourology Society has developed a great deal in the past few years, in parallel with the developments in the rest of the world. Endourology has the advantage of using technology, particularly in the urinary tract stone diseases (UTSDs), and in Turkey UTSDs are frequently identified and seen. With the help of the very well-organised structure of the Turkish Endourology Society we have organised more than 80 courses in the past 2 years on the topic of endoscopic management of urinary tract diseases as well as other topics in urology. The development of endourology in Turkey is very similar to the development of endourology in the rest of the world, particularly the developed countries, this includes robotic surgery and all sections of endourology. We are actively performing endourological applications and compared to 10 years ago we do not carry out open surgery very frequently; most of the time we apply endourology in UTSD, urinary tract cancers, and the rest of the urological conditions.

Dr Canda asks Prof Derya Balbay to comment on the 11th National Endourology Congress and what this year's congress is all about:

Actually let us start from 2 years ago. We have decided to organise this congress as an international congress; despite the name National Endourology Congress, it has become an international meeting because we have speakers from all over the world, including the USA, Canada, UK, Germany, Romania, the United Arab Emirates, Iran, and Azerbaijan. We also have participants from at least eight countries including Azerbaijan, Iran, Iraq, Yemen, Greece, Egypt, and Qatar. We have over 500 participants attending this meeting this year. We started to follow the endourology congresses over the past 2 years, which are held almost anywhere in the world, and to work on the programme of this congress; we decided what to include in this congress based on what was discussed at other congresses or meetings. We tried to identify the hot topics and future topics and I am glad that there is a big interest among participants on the topics that are being discussed currently

at this meeting. I am happy to have international speakers who are also prominent urologists from all over the world. They have been delivering wonderful lectures in their own fields including endourologic procedures and also the EAU lecture on the use of magnetic resonance fusion-guided targeted biopsies in the detection of prostate cancer.

Dr Canda asks Prof Fatih Atuğ: Are there any courses organised within this meeting, and if so, what sort of courses? Do you think the younger generation has a greater interest, compared with previous years, in urology and endourology?

I think that there is a great increase of interest in endourology. Every year the Turkish Endourology Society gets bigger and the number of contributors to this congress is now greater than 500 people; we will have even more participants in the next few years. What was the purpose of this meeting? As Dr Balbay mentioned before, we decided to make this an international meeting, we want Turkey to be a bridge between Asia and the Middle East and Europe and the USA. We invited urologists from Iran, Qatar, and Iraq as well as from other Gulf countries, and we invited very well-known urologists from the USA and Europe; in order to build connections we will share the knowledge in Turkey. In addition, we have several courses on topics such as uteroscopic surgery and laparoscopic surgery, like we do at most of our congresses. I think interest in endourology is increasing every year.

Dr Canda asks Dr Ali Serdar Gözen, International Correspondent and past Editor-in-Chief of EMJ Urology: What are you going to do on the E-BLUS course in this meeting? Can you tell us about laparoscopic development in Turkey, and compare endourology in Turkey with Germany and Europe? What are the differences and similarities, and what is the future of Turkish endourology compared to Germany and the rest of Europe?

We have started laparoscopic training with a programme, and we are working on standardisation of this programme to be able to give this training at the same standard all over the country, and in Europe. We have started with the young residents in Prague, in the European residents' training meeting every year, and we have seen a big request for laparoscopic training, 4 years before we started the standardisation of this training. We started with the basic training programme, which is just basic skills in laparoscopy; thereafter we worked on an intermediate training programme, and the last step will be the advanced training programme before going on to operate on human patients. To develop a programme you need structured exercises; to be able to work on this you need a lot of candidates, you need statistics, you need feedback at the end; you can put out a programme and then try to develop more or widen this programme over the world. That is what we have done.

"We definitely and desperately need some competitors, which I am sure will show up and thus drive the price down to affordable levels so many more patients can benefit from robotic surgery."

We started in the Netherlands, we first took care of what is standard training, in addition to the requests of the residents, and then we focussed on the basic steps in laparoscopy: how to use the instruments, how to hold the needle holder, how to bring the needle into different positions, just the basics. In the end, after giving this training to more than 2,000 residents, we reached a median level, which is first the performance and then the time limit. Thereafter we started to give this training at an international level. We are happy to be able to give this course here and we are happy to be able to hold an exam at the end of the congress, and grateful to all of the organisers here; they have given us the chance to be able to work with the young urologists in Turkey. In the context of the training programmes in Turkey and Europe 10 years ago, we were really at the forefront in Europe. We have reached the top level in urology and our level of performance as well as our scientific development, evident in the literature, is comparable with all of the European and American countries. I am very optimistic for the future as I have seen the interest in urology and the support from the society and the mentors here. I am certain that we will reach a better level in a very short time.

Dr Canda asks Prof Taşçı: How did you start robotic urology, and what is the future of this in Turkey?

My department has performed more than 600 cases since the beginning of 2009 so it is one of the central robotic surgery centres in our country. The most effective and frequent application of urological robotics is in prostate cancer. You can apply robotics in other urological conditions but in my opinion it is most efficient in prostate cancer; I do not think that it would be very useful in other urological diseases, nor is it very cost effective in the rest of the urological diseases. We know that increased cost is a disadvantage of robotic surgery.

Dr Canda asks Profs Balbay and Atuğ: Apart from prostate cancer, in what sorts of diseases are you applying robotic surgery?

For some urology cases you should not use robotics — there is no doubt about this — and these include varicocelectomy, nephrectomy, and cholecystectomy, which can be done by simple laparoscopy. However, I also use robotic surgery in the treatment of several different uro-oncological conditions, including partial nephrectomy, and as you know very well, we have also done many radical cystectomies and intracorporeal continent orthotopic bladder substitutions with the use of robots. I believe that as data accumulates about the efficiency of robotic surgery and lower complication rates, the use of the robotic da Vinci Surgical System will be shown to be paramount, especially in such cases. But for the time being, I can say that partial nephrectomy is also a very good

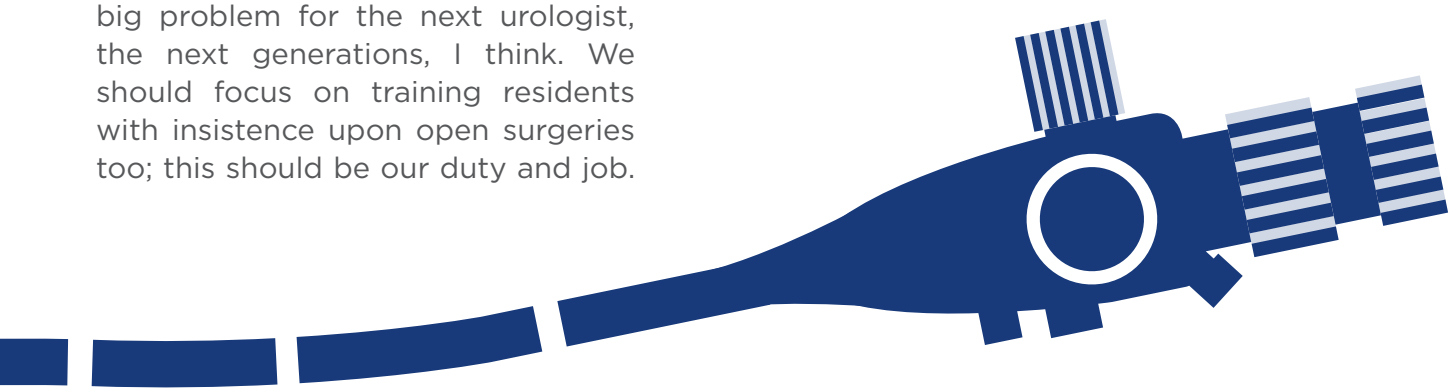
operation that can be done with the use of robot as with radical prostatectomies. However, there are some problems with robotic surgery; it is very expensive and the price of the equipment and maintenance makes it less usable for the treatment of many urological and other surgical procedures in other subspecialties. The other problem with the da Vinci Surgical System is that there is only one manufacturer; we definitely and desperately need some competitors, which I am sure will show up and thus drive the price down to affordable levels so many more patients can benefit from robotic surgery.

Dr Canda asks Prof Atuğ: Is there any other application of robotic surgery besides these diseases? The number of open surgeries have decreased, does this have a negative impact on the training of the residents, does this prevent them from learning open surgery? Will it be a problem in the future?

Yes, I think it will be a problem for future generations. I will give you an example: when I was in the United States between 2004 and 2007, I saw only one open case. So think about this generation of surgeons; they are not doing any open surgeries! If something happens to the robot, if it breaks, fails, what will happen? They do not know how to do an open surgery, so that is a very big problem for the next urologist, the next generations, I think. We should focus on training residents with insistence upon open surgeries too; this should be our duty and job. Think about a surgeon who does not know open surgery and only does robotic surgery. This may have a negative impact in the future.

Dr Canda asks Dr Gözen to make a comparison between the training provided to resident urologists and endourologists in Germany, Turkey, and the rest of Europe.

In Turkey, the mentality is totally different. When we compare a European resident with a Turkish or Middle Eastern resident they have totally different expectations, totally different life planning, and totally different systems too. In Germany we expect that the resident will learn what he has to do in the office; good diagnosis, good and correct indication, knowing the guidelines, and performing all the diagnostic procedures including cystoscopy. But if they want to learn more they have to stay in the clinic after being urologists. If they do not want to learn operating they can skip this and then work from the office and take care of their patients before and after their operation. This is also a very important part of medical care. The most important thing is that not everybody should learn to be able to do every surgery. However, in Turkey, our young residents are really eager to learn all the laparoscopic surgeries in very short time, which they will not be able to do in their future career.



Learning laparoscopy is only important for the high-volume centres and the high-volume surgeries, and you cannot perform a good laparoscopic radical prostatectomy if you have not done more than 30 cases. If everyone tries to accumulate these 30 cases, we will lose perhaps 100 urologists per 1,000 cases with bad oncologic results. On the other hand, we have to give this training as target training for the people who are skilled, who are interested, who want to stay in the scientific field. That is the way we do it in Turkey. In Germany it is very easy, you learn everything, you learn all the diagnostics, you learn all the urology including andrology, paediatric urology — this is also part of urology and we must not forget these parts — and he or she has to do a good diagnosis in the office and has to be able to send the patient to the correct centre to be cured in the best way. In Turkey there are mixed results, we are teaching because we need our residents, they help us, they are trying to learn, they inspect everything, but it is not the solution to teach everybody in laparoscopic or robotic surgery, which is firstly not possible and secondly will not achieve the desired result.

Prof Ali Taşçı, Faculty of Medicine, Bezmialem Vakif University, Istanbul, Turkey
Prof Derya Balbay, Department of Urology, Sisli Memorial Hospital, Istanbul, Turkey
Prof Fatih Atuğ, Department of Endourological and Robotic Surgery, Florence Nightingale Hospital, Istanbul, Turkey
Dr Ali Serdar Gözen, Department of Urology, SLK Kliniken, Heilbronn, University of Heidelberg, Heidelberg, Germany
Dr A. Erdem Canda, Department of Urology, School of Medicine, Yildirim Beyazit University, and Ataturk Training and Research Hospital, Ankara, Turkey

For the full interview click here.

The congress concluded on Sunday 26th April with a session on the "Take Home Messages" of the meeting. Each subspecialty covered by the congress was given a short summation, allowing delegates the chance to reflect on what had been achieved in their respective fields over the course of the long weekend. Over the preceding 3 days, a great deal of ground-breaking research was brought to light, and discussed with much fervour. As Dr Ali İhsan Taşçı brought the meeting to a conclusion with his closing remarks, there was palpable excitement for next year's meeting and the promise of greater strides in scientific discovery. The 11th National Endourology Congress was most assuredly a successful meeting of minds, and the event only looks set to grow in subsequent years. It is clear that medical practitioners everywhere must keep a watchful eye on Turkey, as innovation continues to radiate from this beautiful country.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Ali Ihsan Taşçı

Chairman of the Urology Clinic, Medical Faculty of Bezmialem University, Istanbul, Turkey.

Q: How did you come to specialise in endourology? Was it always your ambition?

A: Specialisation in surgery was an ambition of mine. I did not specifically consider urology, however, and I had the chance of specialising in urology and worked in one of the best centres in Turkey. I am very happy to focus on endourology.

Q: How does Turkey compare with the rest of Europe and the world, in both the prevalence of urological conditions and the quality of their treatment?

A: The prevalence of urological conditions in Turkey is similar to that in Europe except for some aspects. For example, urolithiasis is a more common health problem among the Turkish population and the prevalence of prostate cancer is lower than in European countries. There is no major difference in terms of treatment modalities between Turkey and Europe as all modern endourological methods for stone disease are applied in Turkey. Moreover, I believe that Turkish urologists are more experienced with stone disease compared with urologists in Europe.

Q: If there are any differences between countries, what can the rest of the world learn from the Turkish experience and vice versa?

A: Minimally invasive techniques, such as retrograde intrarenal surgery and standard, mini, ultramini, and micro-percutaneous nephrolithotomy (PCNL) have been applied in most centres in Turkey. These centres then share their experience through the studies presented at international conferences, congresses, and journals.

Q: How has the increasing use of robotic assistance and advanced imaging software impacted upon the application of laparoscopy on a day-to-day basis?

A: Robotic-assisted laparoscopic surgery is increasingly applied in urology. With increasing experience and greater observation of the advantages, it will likely become more commonly used as technological developments continue to improve in quality. Similarly, there have also been further developments in imaging methods and I believe that integration of these imaging methods into robotic surgery will increase success rates.

Q: With the high cost of robotic-assisted surgery reducing its accessibility across the world, how long do you think it will be until this technology will become more cost effective? And are there any policies that you think governments could enact to make this happen more quickly?

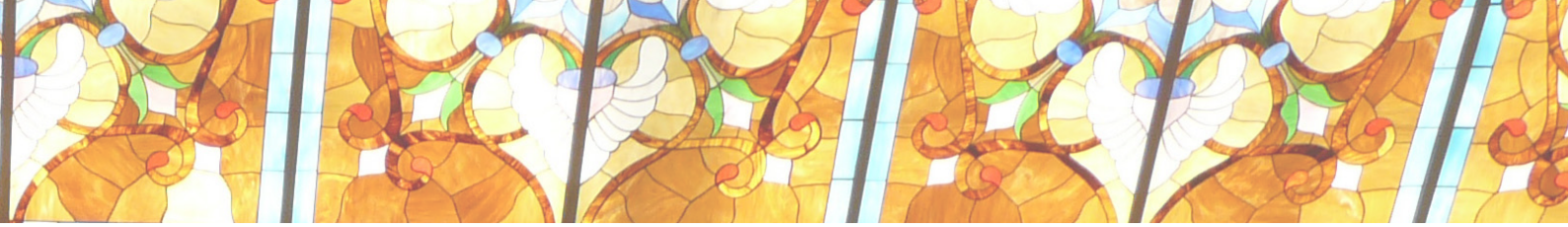
A: There is an integrated monopoly for robotic-assisted surgery systems and this situation leads to increased costs. I believe that costs will decrease and we will have the chance to apply this technique more widely with the development of new companies producing robotic systems. National governments should support researchers in terms of development and production of these technologies.

Q: Why is maintaining urological health so important in the paediatric setting?

A: The prevention and management of urological conditions in the paediatric population is very important because children are more sensitive and sequelae may have personal and social effects if the conditions are not treated properly.

Q: Many people feel too embarrassed to speak to their doctor about urological problems and conditions, often leaving them to progress and worsen. What are the health implications of neglected urological cases?

A: The negligence of urological conditions may lead to progression and chronic health problems that require long-term treatment. Sometimes the treatment of neglected disease may be impossible because of the progression. Urological diseases are sometimes neglected for cultural reasons. Some simple conditions that are easily treated in the early stages may be more complex if left untreated or misdiagnosed.



"Robotic-assisted laparoscopic surgery is increasingly applied in urology."

Q: What advice would you give to men and women who feel too self-conscious to visit a doctor about their urological health?

A: When an abnormal change in the body occurs it should be acknowledged. Every man must learn how to perform testicular self-examination, especially for testicular cancer and other diseases. Haematuria, the major symptom of urological cancers, should alert people. In addition, men and women should undergo check-ups at regular intervals according to their age group and other risk factors in order to safeguard against disease.

Q: What were the main talking points at the 11th National Endourology Congress, and how do they align with your own views? In your opinion, what was the most important presentation that you attended? Have any discussions impacted upon your work directly?

A: Advances in the endoscopic treatment of stone disease were some of the most important topics of the congress. The treatment of stones with retrograde intrarenal surgery was shown to be the treatment of choice for larger stones too. The results showed that the extent of improvements in PCNL and extracorporeal shock wave lithotripsy treatments was less when compared with retrograde intrarenal surgery. The developments in this field showed us the increased need for endourological training courses.

Q: What was the single biggest challenge of your career and how did you overcome it?

A: I have gained experience in almost all areas of endourology and have developed applications for robotic prostate surgery at an expert level. Transferring these experiences to young colleagues was my biggest goal and we have worked on this during the previous 2 years; the endourological association has held more than 80 regional and one-to-one training sessions in many regions of Turkey. Laparoscopy training on pigs has also been organised. The most important factor in achieving this success was that the work was carried out by the Endourological Association itself. In particular, international courses and congresses have provided many opportunities for the exchange of knowledge.

A. Erdem Canda

Associate Professor of Urology, Department of Urology, School of Medicine, Yildirim Beyazit University, Ankara Ataturk Training and Research Hospital, Ankara, Turkey.

Q: Why did you choose to specialise in urology during your medical training?

A: I was very keen on surgery during my medical education and I knew that urological surgery involved using technological surgical equipment such as endoscopes and laparoscopic instruments. Therefore, I decided to go for urology after completing my medical education.

"To be familiar with endosurgery is important."

Q: How would you describe the pace of progress in the field of endourology during your time in the field?

A: Urology may be the leading specialty among all surgical fields in terms of the level of technological development, such as in the use of robotic assistance, for example. In addition, flexible ureteroscopy and endoscopes have developed very much during the past 10 years.

Q: How has the increasing use of robotic assistance and advanced imaging software impacted the day-to-day routine of a hospital urology department?

A: Currently, advanced imaging technologies are frequently used in the diagnosis of prostate cancer (PrC) and kidney cancer (KC). Likewise, robotic surgery is increasingly being applied in the minimally invasive surgical management of PrC, KC, and bladder cancer.

Q: How has the introduction of robotic technology affected the training of young urologists?

A: With the help of magnified vision and 3D technology, residents are able to better see the anatomical and surgical details that I think facilitate their understanding of the surgical steps. Likewise, we also use robotic surgery in order to teach anatomy to the medical students in the operating room. On the other hand, the number of open procedures that the residents are exposed to has decreased, which might be a disadvantage in the long term.

Q: How would you describe the current uptake of robotic-assisted surgery in urology departments both across Europe and internationally, and what are the greatest challenges to clinical teams wishing to apply these techniques?

A: Robotic surgery is increasingly being applied worldwide, including Europe. Robotic surgery has many advantages compared with open surgery and is currently an accepted minimally invasive treatment modality, particularly in the treatment of PrC and KC. 'The train has left the station' when it comes to the discussion regarding open versus robotic surgery.

Q: What is your opinion on invasive surgery, and how does this fit into modern urological practice?

A: Invasive surgery is an important part of our practice. Laparoscopic and robotic surgical approaches are not suitable for all types of disease.

Q: Are there any changes that you would like to see in the field of urology, either on a global scale or on a more personal level?

A: I would expect the cost of instruments, including those for robotic surgery, to start decreasing soon.

Q: Do you see yourself branching out into new areas of research in the future?

A: Yes, into the areas of targeted, individualised therapy and proteomics.

Q: Do you have any advice for students or young doctors thinking of starting a career in urology?

A: To be familiar with endosurgery is important. However, one has to be good and experienced in performing open surgery too. It is important to have a basic science background i.e. having at least 1 year's experience in the laboratory is essential because it provides a taste of scientific thinking.

M. Derya Balbay

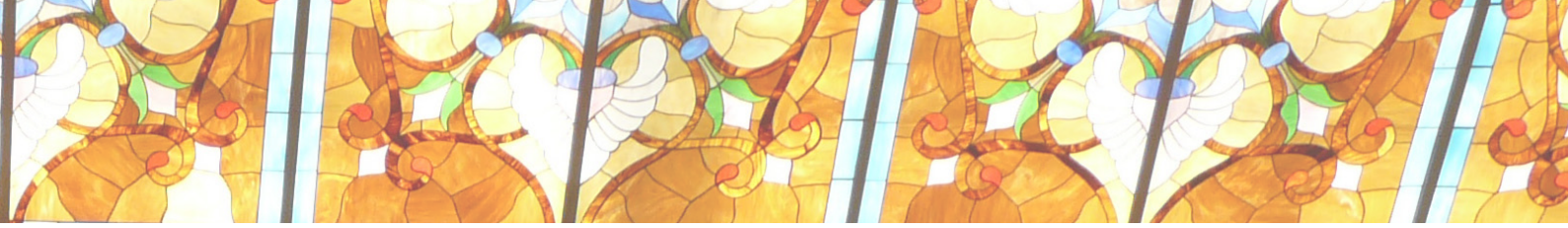
Urologist, Urooncology - Robotic Surgery, Memorial Sisli Hospital, Istanbul, Turkey.

Q: Since you began your career in endourology, have there been any dramatic changes that you have witnessed within the field, either concerning the treatment and management of patients or the prevalence of endourological conditions?

A: When I was a resident, the most common endourological condition and procedure performed were bladder tumours and transurethral resection of the prostate. If you had access to paediatric cystoscopes and resectoscopes then you were considered very lucky. Percutaneous nephrostolithotomy and ureterorenoscopy were procedures performed at few centres around the world, as was extracorporeal shock wave lithotripsy. The use of lasers was in its infancy. When we talk about ureterorenoscopy then we are referring to rigid ureteroscopy. Laparoscopy was unknown to us. Aside from flexible ureteroscopes, even flexible cystoscopes had not yet been invented. Needless to say, robotic surgery could not have been imagined in those days.

Q: How does the treatment of urological conditions differ between adult and paediatric patients?

A: Children cannot always accurately pinpoint their symptoms and so high levels of suspicion



and doubt should be present for the physicians taking care of them. Otherwise, it can be easy to overlook or misdiagnose their illnesses. Urological problems in childhood are either congenital or acute in nature; they are not, for the most part, chronic conditions. Many congenital disorders should be corrected surgically. Since children continue to grow, adaptation of the body after surgery is much more satisfactory. Unfortunately, however, in the case of neoplastic diseases, diagnosis is much more difficult during the earlier stages, and may be difficult to cure for the same reason. The long-term consequences and side-effects of surgical therapies and chemotherapy will be seen in adulthood. With regard to endourological treatments, it has always been the general rule that surgical instruments and techniques have been developed for adults and adapted for use in children.

Q: There have been several advancements in minimally invasive surgical technology over the past few years. Which piece of equipment have you found to be most useful in your work, and what impact has this piece of technology had upon endourological surgery as a whole?

A: Together with the advancements in laser technology, I believe that retrograde intrarenal surgery will replace percutaneous approaches for the treatment of urinary stone disease in most cases. Robotic surgery will certainly play a prominent role, especially in treating urological cancers, ablative surgery, and correction of congenital diseases. However, because there is a monopoly in the field, the expensive costs of both utensils and equipment limit its widespread use. Therefore, we desperately need competitors, which will hopefully bring costs down.

Q: How has such an increasing advancement in technology impacted upon the training and education of young endourologists and those just starting out in the field?

A: Since urology is more often becoming endourology, our branch of medicine is to some degree technology-dependent. Centres where urology or endourology training is given should invest significant funds to provide up-to-date healthcare for patients and become more attractive to residents. Resources are also needed for the maintenance of endourology equipment. For example, a centre should invest significant resources into the annual maintenance of surgical robotic systems. Flexible instruments also have limited lives. These investment and maintenance costs will hinder many medical schools or residency training centres. As a result, a considerable number of centres will lack some of these technologies at any one time and not all urologists will complete their training in the field of endourology. The other potential problem is that urologists will gain even less experience in open surgery. If one day they need to convert to open surgery for any reason during endourological procedures then this could cause serious problems.

Q: In your opinion, what is the greatest current challenge faced by endourologists in Europe today, and how can we best begin to address this?

A: As stated above, it would be costs, investment, and inexperience with open surgery. To compensate for this, trainees in endourology should rotate between centres and it will take longer to reach completion of the prerequisite surgical procedures. In addition, expensive instruments such as surgical robotic systems should be transported between centres in cars specially manufactured to serve as operating theatres for certain periods, so that surgeons can perform robotic surgery in these 'operative theatre cars' and transfer their patients to wards thereafter for postoperative care. When efficient use of these cars cannot meet the demand then another car can be purchased accordingly. This method would result in saving a considerable amount of money that would otherwise have been invested in surgical robotic systems or their maintenance. Endourologists should also gain experience in open surgery using animal models in case they need to complete surgical procedures with open techniques.

"We are expecting more than 500 participants to attend our National Endourology Congress."

Q: How many delegates are expected to attend this year's 11th National Endourology Congress, and will there be a running theme or message that will be emphasised at the event?

A: We are expecting more than 500 participants to attend our National Endourology Congress. We are also expecting participants from neighbouring countries as well; we have invited distinguished speakers from all over the world. In Turkey, our purpose is to be the meeting point of east and west, which is also the theme of this event.

Q: Are there any topics that you are particularly excited about being covered at Endourology 2015?

A: Techniques to improve our success concerning potency and continence after radical prostatectomy, as well as applications of endourology in different urological subspecialties covered under the title 'Endourology in Motion'.

Q: Which three pieces of advice would you give to a student or trainee just starting out on their career in endourology?

A: Firstly, you should be focussed on the way that you want to proceed in endourology. Secondly, you should watch as many surgeons and procedures (performed in multiple ways) as possible, and discuss all the pros and cons of their techniques with them. Thirdly, start practising endourology with a mentor(s) and adopt their techniques, depending on the experience that they have gained, observed, or discussed with other endourologists.

Q: Where do you expect the field to be in 5 years' time, assuming that technological and medical progress continues as it has in recent years?

A: I would love to see robotic arms miniaturised to 2-3 mm in diameter. If this is achieved then we should not worry about performing difficult 'single-site' surgeries anymore. Another great advancement would be for surgeons to work on 3D images preoperatively and mark dissection planes on these images. If they do not like the dissection planes that they have already marked then they can rewind and go back to change them. If these images are loaded into robots then almost flawless dissections would be performed, either by the robot itself or under the guidance of these previewed and marked images.

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ROBOTIC-ASSISTED LAPAROSCOPIC TRANSPERITONEAL ADRENALECTOMY: OUTCOMES OF INITIAL FIVE PATIENTS

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ABSTRACT

Objective: To report the outcomes of transperitoneal robotic adrenalectomy (RA) procedures in five initial cases performed at two institutions.
Methods: Between March 2012 and November 2014, five patients underwent RA. A transperitoneal approach was taken by using the da Vinci-S four-arm surgical robot. Outcomes were assessed retrospectively.
Results: Mean patient age was 42.6±5.1 (range: 34-47) years. Mean body mass index was 30.5±4.5 (range: 23.2-35.2) kg/m^2. Median tumour size detected on radiological imaging was 3.1±1.7 (range: 1.2-6.0) cm. Mean operation time was 129.0±12.4 (range: 120-150) minutes and median estimated blood loss was 100.0±119.3 (range: 50-350) ml. No intraoperative or perioperative complications occurred according to the modified Clavien complication scale. Median duration of hospital stay was 2.0±1.7 (range: 2-6) days. The fourth robotic arm was used in two patients. Histopathology results demonstrated: metastasis of renal cell carcinoma occurred in 1 case, adrenal cortical adenoma in 2 cases, pheochromocytoma in 1 case, and hyperplasia in 1 case. After a median follow-up of 17.0±15.0 (range: 3-40) months, no local recurrence was detected.
Conclusion: RA is a safe minimally invasive surgical approach that has excellent surgical and oncological outcomes in the treatment of adrenal masses <7 cm in size.

Keywords: Robotic adrenalectomy, adrenal mass, minimally invasive approach.

INTRODUCTION

Minimally invasive adrenalectomy has become the gold standard treatment of benign adrenal tumours since it was first described in 1992.[1] Recent studies have shown many advantages, including shorter duration of hospital stay, less pain, and decreased blood loss when compared with open surgery.[2-6] After the introduction of the da Vinci robotic system (Intuitive Surgical, Sunnyvale, California, USA), a robotic adrenalectomy (RA) series showing the feasibility and safety of the procedure has been reported.[7] The utilisation of robotic technology in adrenalectomy has facilitated the procedure by providing 3D and magnified views of the operative field and excellent control of robotic instruments. Transperitoneal and retroperitoneal approaches for RA, demonstrating the efficacy of both techniques, have been described in several reports.[8,9] Herein, we describe our surgical technique and report the outcomes of the initial transperitoneal RA procedures performed at two institutions.

PATIENTS AND METHODS

A total of five patients underwent RA transperitoneally between 2012 and 2014, and which utilised the four-arm da Vinci-S robotic surgical system. The indications for RA were: hormone-secreting tumours, solitary small pheochromocytomas, hormone-inactive lesions >3 cm in size and demonstrating growth over time, and lesions >5 cm in size with or without a growing feature. In order to determine the location and size of the adrenal mass, the patients were scanned with abdominal computed tomography (CT) or magnetic resonance imaging (MRI). Serum and urine levels of catecholamines and cortisols were evaluated preoperatively. Intraoperative and perioperative (1-30 days) complications were evaluated with regard to the modified Clavien classification system.[10] In addition, patients' age, tumour side, gender, body mass index (BMI), American Society of Anesthesiologists score, utilisation of the fourth robotic arm, radiological tumour size, histopathological results, duration of hospital stay, operation time, blood loss, and pathological tumour size were determined, and the data were recorded.

Patient Preparation and Positioning

In order to minimise the risk of bleeding, patients using antiaggregants or anticoagulants discontinued these medications at least 1 week prior to surgery. Before the administration of general anaesthesia, thigh-high anti-embolism stockings were applied on both legs in order to prevent deep vein thrombosis and embolisation. Thereafter, the patient was placed in a 60° flank position with the surgical bed flexed, to have a clear view of the surgical field. Depending on the operating surgeon's preference, an intraperitoneal incision was performed by inserting a Veress needle or with the open Hasson's method, approximately 1 cm lateral to the umbilicus to begin surgical access. Pneumoperitoneum at 15 mmHg was maintained with CO_2 insufflation by placing a 12 mm robotic camera trocar. Following that, an 8 mm port was placed approximately 4 cm craniomedial to the spina iliaca anterior superior (SIAS) for the first robotic arm, and an 8 mm robotic port was placed to the arcus costarum at midclavicular line under direct vision for the second robotic arm. A 10 mm assistant port was placed 2 cm medial to the line connecting this robotic port and the camera port. Finally, in cases in which the fourth robotic arm was used, an 8 mm robotic port was placed approximately 2 cm below SIAS under direct vision and at the surgeon's discretion. Port placements were performed similarly for the right and left sides. Following that, the robotic unit was docked with a 15° angle from the back of the patient and the operation was started by connecting the robotic arms and introduction of the robotic instruments through the ports.

Surgical Technique

On the right side, the triangular ligament of the liver is divided and the liver is retracted superiorly with a retractor to exposure the adrenal gland and vein. After the colon medialisation the adrenal gland can be exposed properly. On the left side, splenocolic ligament, splenorenal ligament, and the lateral attachments of the spleen are divided and the colon is medialised completely to expose the adrenal gland and vein. After identifying the adrenal vein, it is cut following application of standard laparoscopic Hem-o-lok® endoclips placed by the bedside assistant. After the control of the adrenal vein, dissection is performed on the superior and lateral borders of the gland. Then, the gland is dissected from the upper kidney pole. The arterial supply can be cauterised by using monopolar and bipolar energy. The gland is placed in an endobag by extracting it with the adipose tissue overlying it. Thereafter, an absorbable fibrin sealant patch (TachoSil®) may be applied if required to the surgical field for adequate haemostasis. Intra-abdominal pressure is decreased to 5 mmHg at the end of the procedure in order to check if haemostasis has been achieved. Lodge drain is inserted through the trocar site. After the robotic unit is de-docked, the specimen is extracted from the abdominal cavity contained within the endobag by enlarging the insertion site of the camera port.

Postoperative Follow-up

Patients were given intravenous fluids, analgesics, and antibiotics postoperatively. Urethral catheters and drains were removed on the first postoperative day and patients were discharged home thereafter. Routine biochemistry and complete blood count tests were carried out immediately after surgery and on the first postoperative day. Following abdominal CT in the third postoperative month, patients with benign histopathological results were followed-up with annual abdominal ultrasonography and hormonal evaluations.

Table 1: The results of selected robotic adrenalectomy series in the literature.

Authors	N	Histopathology (n)	Tumour size (cm)	Operation time (min)	Hospital stay (days)	Complications (n)
Morino et al.[11]	10	Adenoma (3), aldesteronoma (3), pheochromocytoma (4)	3.3	169	5.7	0
Brunaud et al.[12]	100	Adenoma (19), aldesteronoma (39), pheochromocytoma (24), cyst (2), Cushing's adenoma (11), hyperplasia (5)	2.9	171	6.4	Cyst rupture (1), bleeding (3), wound infection (1), urinary infection (1), facial oedema (1), pneumonia (1)
Giulianotti et al.[13]	42	Adenoma (19), aldesteronoma (2), pheochromocytoma (9), cyst (6), Cushing's adenoma (11), hyperplasia (2), others (4)	5.5	118	4	Capsular tear (1)
Karabulut et al.[14]	50	Adenoma (10), aldesteronoma (8), pheochromocytoma (12), Cushing's syndrome (8), others (7), metastasis (5)	3.9	166	1.1	Atelectasis (1)
Agcaoglu et al.[15]	25	Adenoma (7), cyst (5), pheochromocytoma (8), others (5)	6.5	159	1.4	0
Aksoy et al.[16]	42	Adenoma (10), aldesteronoma (6), pheochromocytoma (8), Cushing's syndrome (10), others (8),	4.0	186	1.3	Urinary infection (1), pneumothorax (1)
Our series	5	Adenoma (2), pheochromocytoma (1), hyperplasia (1), metastasis (1)	3.1	129	2.0±1.7 (range: 2-6)	0

The patient with metastatic malignant histopathological findings was followed-up with annual abdominal CT and chest radiography.

RESULTS

The mean age of patients was 42.6±5.1 (range: 34-47) years. The mean BMI was 30.5±4.5 (range: 23.2-35.2) kg/m^2. Median tumour size detected on CT or MRI was 3.1±1.7 (range: 1.2-6.0) cm. Of the 5 cases, 3 procedures were left-sided and 2 were right-sided. Mean operation time was 129.0±12.4 (range: 120-150) minutes and median estimated blood loss was 100.0±119.3 (range: 50-350) ml. No intraoperative or perioperative (0-30 days) complications occurred in any patients, as assessed using the modified Clavien complication scale. The readmission rate during the perioperative period was 0%. Median duration of hospital stay was 2.0±1.7 (range: 2-6) days. The fourth robotic arm was used in two patients.

The indications for adrenalectomy in the 5 patients were: metastasis of renal cell carcinoma in 1 case, adrenal cortical adenoma in 2 cases, benign pheochromocytoma in 1 case, and primary adrenal cortical hyperplasia in 1 case. During the preoperative period, in serum and urine analysis of 3 patients, adrenal derived hormonal and metabolic evaluations revealed no abnormality. Catecholamine levels were elevated in 1 patient with pheochromocytoma, while serum and urine cortisol and glucose levels were elevated in 1 patient with adrenal cortical hyperplasia. Surgical margins were negative in all cases. Median pathological tumour size was detected as 3.5±1.5 (range: 1.7-6.0) cm. After a median follow-

up of 17.0±15.0 (range: 3-40) months, no local recurrence was detected.

DISCUSSION

In the literature there are several reports evaluating the efficacy of RA, which are summarised in Table 1.[11-16] In the first randomised study comparing robotic and laparoscopic adrenalectomy (LA), it was considered that the operative time was longer and the perioperative complication rate was higher in the robotic group.[11] Also, in cost analyses, RA was found to be more expensive than LA. In another study, the authors prospectively evaluated 100 consecutive patients who underwent robotic, unilateral, transperitoneal adrenalectomy,[12] and determined the learning curve for RA and factors that influence operative time and cost. As a result, surgeons' experience, first-assistant level, and tumour size were independent predictors of operative time. In cost analyses, the robotic procedure was 2.3-times more costly than transperitoneal LA. The authors also concluded that, although the robotic approach is expensive, it provided better quality of view and greater ergonomics to the surgeon. In recent publications, it can be seen that the duration of hospital stay is quite short, [9,14-16] which is considered to balance the unfavourable cost of robotic surgery. In our study, even though there have not been any intra or perioperative complications, it was observed that the duration of hospital stay was longer relative to these other publications. Even though the mean tumour size and operation time in our study are similar to those described by these publications, it may be that the longer duration of hospital stay is attributable to being more cautious with the initial cases in the postoperative follow-up.

It is still controversial as to whether the RA should be performed by transperitoneal or retroperitoneal approach. Several surgeons prefer the retroperitoneal technique in patients with tumours <6 cm in size, if the distance between the skin and Gerota's space is 7 cm and the 12th rib is rostral to the renal hilum in order to provide the best ergonomic trocar placement.[17] Although the retroperitoneal technique necessitates previous experience with the transperitoneal approach, a retroperitoneal approach should be preferred in patients with abdominal scarring and adhesions. In our cases, previous laparoscopic transperitoneal experience has been the most significant factor leading us to prefer this approach. In a recent study that analysed intraoperative time use and perioperative outcomes in robotic versus LA for both transabdominal and retroperitoneal approaches, intraoperative time use was similar between the laparoscopic and robotic groups for both transabdominal and retroperitoneal approaches.[14] However, the authors concluded that the morbidity was less and hospital stay was shorter after the robotic procedures.

Obesity is another concern in minimally invasive surgery as it increases complications and morbidity associated with the surgery. In a publication comparing RA with laparoscopic methods in obese patients, it was determined that the tumour size, blood loss, surgery duration, and duration of hospital stay were similar, and there was no significant difference between the operative and perioperative period morbidities of the groups.[16]

In our cases, the histopathological evaluation revealed metastasis of renal cell carcinoma of the contralateral kidney in one case. Metastases are the second most common tumours of adrenals after adenomas.[18] The most common primary malignancies with adrenal metastases are lung, kidney, breast, and colon.[19] It is indicated that patients, especially those with solitary adrenal metastases of smaller tumour size, may benefit from surgical resection.[20] In our cases, the patient with adrenal metastases of renal cell cancer had undergone radical nephrectomy previously. At postoperative Month 40, no tumour recurrence or any lesion involving the kidney was demonstrated in this patient.

In a recent systematic review and meta-analysis of robotic versus LA, including 600 patients (277 robotic and 323 laparoscopic), the authors found no differences in terms of conversion to open surgery rates, operation time, and complications.[21] However, it was concluded that the robotic approach could provide the potential advantages of a shorter hospital stay, less blood loss, and lower occurrence of postoperative complications. The number of robotic operations performed globally is predicted to increase, with an increasing number of centres adopting robotic technology. Despite the advantages that this technology provides, the disadvantage of robotic operations is their high cost. On the other hand, considering shorter hospital stays and recovery, it can be expected that the cost of robotic operations will decrease in time.

CONCLUSION

In our experience, RA is a safe and feasible minimally invasive surgical approach with excellent surgical and oncological outcomes in the treatment of adrenal masses <7 cm in size.

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TRANSPERITONEAL LAPAROSCOPIC ADRENALECTOMY FOR ADRENAL TUMOURS: EXPERIENCE WITH 54 PATIENTS

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ABSTRACT

Objective: To present our laparoscopic surgery experience in the treatment of adrenal masses.
Methods: Between January 2008 and March 2015, a total of 58 adrenal glands in 54 patients (39 females, 15 males) underwent transperitoneal laparoscopic adrenalectomy (TLA) to remove an adrenal mass. The patients underwent hormonal evaluation, triphasic magnetic resonance imaging, and/or abdominal computed tomography. Thirty-one patients (57.4%) had a hormonally active adrenal mass.
Results: Twenty-nine right, 21 left, and 4 bilateral TLA were performed. The mean age and body mass index of the patients were 49.5±11.2 years and 27.2±4.3 kg/m2, respectively. The mean adrenal mass size, operation time, estimated blood loss, and hospitalisation duration were 35.9±15.0 mm, 92.7±29.6 minutes, 50.8±33.1 ml, and 3.7±2.5 days, respectively. No minor or major complications were observed postoperatively. In pathological examinations, 38 (70.3%) patients had adenoma or adrenal hyperplasia, 8 (14.7%) had pheochromocytoma, 2 (3.7%) had periadrenal paraganglioma, 2 (3.7%) had adrenal cysts, 1 (1.9%) had schwannoma, 1 (1.9%) had myelolipoma, 1 (1.9%) had myeloid metaplasia, and 1 (1.9%) had adrenal cortical carcinoma.
Conclusion: TLA is a safe and efficient minimally invasive treatment option with a low morbidity rate in the surgical treatment of adrenal masses.

Keywords: Laparoscopy, adrenalectomy, transperitoneal.

INTRODUCTION

Since the introduction of the laparoscopic approach to adrenalectomy by Gagner et al.[1] in 1992, this minimally invasive technique has gained worldwide acceptance and has become the gold standard for the removal of most small, benign lesions of the adrenal gland. The advantages of less perioperative blood loss, less pain after operation, shortened hospital stay, earlier return to everyday life, and better cosmetic results make laparoscopy preferable for patients, and laparoscopy also provides a larger point of view for the surgeon.[2] Several techniques have been described, the most popular being the lateral transperitoneal adrenalectomy (LTA) approach and posterior retroperitoneoscopic adrenalectomy.[3] Each of these techniques is highly successful in experienced hands, and it is recommended that surgeons choose the approach that is most familiar to them. However, adrenalectomies are not common operations in general practice and it can be difficult to overcome the learning curve of approximately 30 cases.[4]

We have performed LTA routinely for adrenal tumours, including relatively large tumours. The purpose of this study was to evaluate our single-centre experience with LTA performed for a variety of adrenal tumours.

METHODS

Fifty-four patients who received LTA for adrenal masses between January 2008 and March 2015 were included in the study. LTA was performed for masses that were hormonally active, hormonally non-active but larger than 4 cm, and smaller than 4 cm but with enlargement in consecutive topographical investigations. Detailed patient histories were recorded and examinations were performed before surgery. Routine biochemical investigations, total blood count, serum cortisol, aldosterone, dehydroepiandrosterone sulphate levels, free cortisol, vanillylmandelic acid, and metanephrine in 24-hour urine analyses were performed. The masses were diagnosed in 39 patients by abdominal magnetic resonance imaging, while 15 patients were diagnosed by abdominal dynamic computed tomography. The Endocrinology and Metabolism Clinic made the preparations, including assessment of the hormonal activity of the mass and preoperative management for hormonally active masses. The masses from 31 patients (57.4%) were hormonally active. Eight (14.8%) of these 31 patient masses were pheochromocytoma and alpha blockers and beta blockers were given to these patients before surgery (addition of metoprolol 50 mg/day on the third day of a 15-day treatment with doxazosin 2 mg/day). The Cushing's protocol was used in patients with Cushing's disease and was continued for 3 days after surgery. The Addison's protocol was used in patients for whom bilateral LTA was planned, and this protocol also continued for 3 days after surgery. For preventing malign hypertension, phentolamine mesylate (a non-selective alpha blocker) was available for the duration of the whole operation. All of the pathological examination results were recorded after surgery.

Statistical Analysis

The definitive data were calculated using Statistical Package for Social Sciences (SPSS Inc., Chicago, Illinois, USA) for Windows version 18.0. All numerical values were given as mean ± standard deviation.

RESULTS

The mean age of the patients was 49.5±11.2 years (range: 16-72). Thirty-nine patients (72.2%) were female while 15 patients (27.8%) were male. Right adrenalectomy, left adrenalectomy, and bilateral adrenalectomy was performed in 29, 21, and 4 patients, respectively. Twenty patients (37%) had clinical Cushing's disease. Patients' demographic features and perioperative findings are listed in Table 1. Blood transfusion was not necessary in any patients. None of the patients had perioperative or postoperative minor or major complications. The laparoscopic modality was changed to open surgery in two patients for whom rightadrenalectomies were performed without complications. One of these patients displayed bradycardia based on severe chronic obstructive pulmonary disease (COPD), while bleeding was the reason for the other patient's open procedure. In pathological examinations, 38 (70.3%) patients had adenoma or adrenal hyperplasia, 8 (14.7%) had pheochromocytoma, 2 (3.7%) had periadrenal paraganglioma, 2 (3.7%) had adrenal cysts, 1 (1.9%) had schwannoma, 1 (1.9%) had myelolipoma, 1 (1.9%) had myeloid metaplasia, and 1 (1.9%) had adrenal cortical carcinoma (ACC). All patients with hormonally active adrenal masses had normal hormone levels after their operation.

Table 1: Patient characteristics and perioperative findings.

Parameter	Value (mean ± standard deviation)
Age, years	49.5±11.2
Body mass index, kg/m^2	27.2±4.3
Mass size, mm	35.9±15
Duration of operation, min	92.7±29.6
Estimated blood loss, ml	50.8±33.1
Duration of hospital stay, days	3.7±2.5
Size of specimen, cm	42.1±15.1

DISCUSSION

Adrenal surgery rates have been increasing in conjunction with the increased prevalence of incidental adrenal masses found during routine cross-sectional imaging. Adrenal glands can be seen more clearly in laparoscopic surgery and therefore vascular structures and parenchyma are more easily controlled. Therefore, the need for open surgery has decreased over time. Primary hyperaldosteronism, pheochromocytoma, glucocorticoid-secreting adrenal masses, hormonally non-active masses larger than 4 cm in size, and masses smaller than 4 cm but showing malignant potential by growth in consecutive computed tomography scans are indications for adrenalectomy.[5] In the literature there are many studies comparing laparoscopic adrenalectomy (LA) with open adrenalectomy (OA) with regard to oncological efficacy, perioperative and postoperative parameters, and complication rates.[6-8] Imai et al.[8] compared results of LTA (n=40) and OA (n=40) in hormonally active benign adrenal masses smaller than 6 cm. In this study, estimated blood loss was lower in the LTA group (40 ml versus 172 ml). Postoperative analgesic consumption was 2.5-times lower in the laparoscopy group and duration of hospital stay was also shorter in the laparoscopy group (12 versus 18 days). The authors concluded that LTA is a safe technique that results in less patient discomfort, lower estimated blood loss, and earlier discharge than OA, with no increase in financial cost. LTA should be adopted as the technique of choice for the removal of functioning adenomas and for adrenal masses less than 6 cm in diameter. Size criteria are, currently, the main subject considered when deciding on the laparoscopic approach to an adrenal lesion. In fact, size is an important variable in predicting malignancy. Tumours larger than 6 cm are likely to be malignant, but many adrenal adenomas are larger than 6 cm. On the basis of the National Institutes of Health consensus statement, the incidence of ACC is 2% for lesions <4 cm, 6% for tumours 41-60 mm in size, and 25% for tumours >6 cm. Therefore, if size is the only criterion used to choose the optimal surgical approach then many patients with benign adrenal masses will have an unnecessary OA.[9] Furthermore, some authors suggest that patients with benign adrenal lesions larger than 5-6 cm should not be treated with LA because of the longer operation time and the elevated risk of bleeding. On the other hand, recent records demonstrate that LA for large adrenal tumours is safe and technically feasible.[10,11] In practice, these limitations of the laparoscopic approach to large adrenal masses depend on the surgeon's experience and skill, and the size of the mass cannot be considered as an absolute contraindication for laparoscopy. In our study, six adrenal masses were larger than 6 cm and there were no differences in the operation time, complication rate, and bleeding compared with the other masses.

Laparoscopic surgery could also be performed for ACC. Brix et al.[12] reported no difference in survival, disease-free recurrence, tumour capsule violation, or peritoneal carcinomatosis between 117 patients undergoing OA and 35 patients undergoing LA for Stage 1-3 ACCs of less than 10 cm in size. In 12/35 patients, LA was converted to OA because of bleeding (n=4), adhesions (n=4), bowel perforation (n=1), or other technical problems (n=2), and intraoperative evidence of malignancy (n=1). The authors suggest that LA performed by an experienced surgeon is justified for potentially malignant adrenal incidentalomas and for selected cases of Stage 1 and 2 ACC.[12] Porpiglia F et al.[13] showed no significant difference in recurrence-free survival between patients with Stage 1 and Stage 2 ACC in 18 patients who underwent LA compared with 25 patients who underwent OA. In our study, one patient's pathological examination result was ACC. This patient had a preoperative enhancing mass of 4.5 cm on the right adrenal gland. No perioperative or postoperative complications were seen and there was no recurrence during this patient's 6 years of follow-up.

Although LA is a minimally invasive procedure, complications can occur with this procedure. Early or late complications take place especially before the surgeon's completion of the learning curve. Early complication rates of 0-15% have been reported in LA.[14] General complications associated with LA include wound haematomas and infection, and deep vein thrombosis; patients with Cushing's syndrome are more prone to infectious and thrombotic complications. Specific complications include injury to the surrounding organs such as the liver, pancreas, spleen, inferior vena cava, renal vessel, diaphragm, and pleura. The most commonly reported complication is vascular injury, which is seen more in right LA. The incidence of this complication varies between 0.7% and 5.4%.[15-18] In our study, no major or minor complications were

seen, the mean operation time was 92.7±29.6 minutes, the mean estimated blood loss was 50.8±33.1 ml, and the mean duration of hospital stay was 3.7±2.5 days. Our results are similar to data from national and international literature. Conzo et al.[19] reported that the risk factors for changing to an open procedure are masses larger than 8 cm and comorbidities. Shen et al.[20] reported the factors that might cause a change to open surgery as being a tumour size larger than 5 cm, body mass index (BMI) ≥24 kg/m^2, and the presence of pheochromocytoma. In our study, the laparoscopic procedure was changed to an open procedure in two (3.7%) patients. In these two patients, tumour sizes were <5 cm and BMI was >24 kg/m^2; the two reasons for changing in these two patients were bradycardia based on COPD and bleeding.

In the national literature, the most common result of histopathological examinations is benign adrenal mass, with an incidence of 60-65%.[21-23] Yavaşçaoğlu et al.[24] performed LA in 33 patients (right LA: 15, left: 17, bilateral: 1) with a mean age of 49 years. The mean mass size, duration of operation, estimated blood loss, and duration of hospital stay were 35.9 mm, 150 minutes, 47 ml, and 3.2 days, respectively. One patient had pancreatic injury during the operation and this injury was managed conservatively without problems. The masses' pathological examination results were: adrenocortical adenoma (69.7%), pheochromocytoma (15%), adrenocortical hyperplasia (6%), ACC (3.1%), metastatic adenocarcinoma (3.1%), and oncocytoma (3.1%). In our study, adrenocortical hyperplasia was found in 70.3% and pheochromocytoma was found in 8 (14.7%) patients.

In conclusion, the incidence of adrenal masses has increased with the usage of radiological diagnostic methods. In the surgical treatment of these masses, LTA is a generally safe, efficient, and minimally invasive method with low complication rates.

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THE EFFICACY AND UTILISATION OF PREOPERATIVE MAGNETIC RESONANCE IMAGING IN ROBOT-ASSISTED RADICAL PROSTATECTOMY: DOES IT CHANGE THE SURGICAL DISSECTION PLAN? A PRELIMINARY REPORT

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ABSTRACT

Purpose: We investigated the effect of prostate magnetic resonance imaging (MRI) on the dissection plan of the neurovascular bundle and the oncological results of our patients who underwent robotic radical prostatectomy operation.
Materials and Methods: We prospectively evaluated 30 consecutive patients, 15 of whom had prostate MRI before the operation, and 15 of whom did not. With the findings of MRI, the dissection plan was changed as intrafascial, interfascial, and extrafascial technique in the MRI group. Two groups were compared in terms of age, prostate-specific antigen (PSA), and Gleason scores (GSs). Surgical margin status was also checked with the final pathology.
Results: There was no significant difference between the two groups in terms of age, PSA, biopsy GS, and final pathological GS. MRI changed the initial surgical plan to a nerve-sparing technique in 7 of the 15 patients. Only one patient in the MRI group had a positive surgical margin on bladder neck. MRI was confirmed as the primary tumour localisation in the final pathology in 93.3% of patients.
Conclusion: Preoperative prostate MRI influenced the decision to carry out a nerve-sparing technique in 46% of the patients in our study; however, the change to a nerve-sparing technique did not seem to compromise the surgical margin positivity.

Keywords: Prostate cancer (PrC), prostate magnetic resonance imaging, robotic radical prostatectomy (RRP).

INTRODUCTION

In recent times, robotic radical prostatectomy (RRP) has increased worldwide and advanced disease is being operated on more frequently. A nerve-sparing approach in both open and laparoscopic techniques is the main advantage in this surgical era.[1] RRP has the advantages of improved visualisation and also improved instrument controls, whereas the lack of tactile feedback is the main disadvantage while dissecting the neurovascular bundle (NVB) and adjacent tissues around the tumour. Extensive resection of the NVB carries the high risk of impotence and compromised continence. On the other hand, preservation of the NVB without a preliminary evaluation of the tumour extent may lead to residual tumour tissue at the bundle and/or fascial sites. For a better preoperative visualisation and planning for the dissection of NVBs, a preliminary prostatic magnetic resonance imaging (MRI) could be a useful tool. A preoperative assessment of the tumour location,

the presence of extracapsular extension, or seminal vesicle and NVB invasions may lead the surgeon to plan nerve-sparing or not. With the ongoing technological innovations in radiology, multi-parametric and endorectal coil MRI localises the high volume and high-grade prostate cancer (PrC) tumour areas.[2-9] Recent studies have detailed the prostate and the adjacent tissue anatomy, especiallythe fascial content NVB.[10] In light of these studies, a preoperative MRI of the prostate may guide the surgeon's dissection plan in RRP. We aimed to report the preliminary data of the oncologic results of patients who underwent RRP with or without prior MRI.

MATERIALS AND METHODS

Between January 2014 and February 2015, we prospectively evaluated 30 consecutive patients who had a biopsy proven adenocarcinoma of the prostate and were candidates for RRP, 15 of whom had a preoperative prostate MRI (Group I), and 15 of whom did not (Group II). Exclusion criteria of the study were diagnosis of metastatic disease, previous anti-androgen or androgen blockage usage, and pre-existing erectile dysfunction. All MRI were evaluated for extracapsular extension by a single radiologist specialising in prostate MRI. With the findings of prostate MRI, the dissection plan was chosen as intrafascial, interfascial, and extrafascial technique in Group I. In Group II, the dissection plan was planned according to digital rectal examination and in the preoperative risk group of patients according to the D'Amico risk classification. A single surgeon carried out all operations. Two groups were compared in terms of mean age, PSA ranges, the biopsy, and final pathologic Gleason scores. Surgical margin status and localisation of tumour was also determined with the final surgical specimen and was subsequently mapped on macroscopic photographs to demonstrate tumour extent and multifocality. Univariate analysis for age, PSA, biopsy Gleason score, and prostatectomy Gleason score was performed using the Mann Whitney U test and T test for continuous variables. SPSS version 15 was used for statistical analysis with the 2-tailed level of significance set at $p<0.05$.

RESULTS

The mean follow-up time after surgery was 8.4 (1-16) months. There was no statistically significant difference in terms of age, PSA, biopsy, and final pathologic Gleason scores between two groups (Table 1). Patients were stratified according to the D'Amico risk groups as low, intermediate, and high risk (Table 2).

Table 1: Demographics of two groups in terms of age, PSA, biopsy and final pathologic Gleason scores, and surgical margin positivity.

	Group I (n=15)	Group II (n=15)	p
Age	62.56	62.26	0.662
PSA* (ng/dl)	8.1	6.17	0.184
Positive surgical margin (n)	1	0	
Biopsy Gleason score	7.06	6.66	0.513
Prostatectomy Gleason score	7.0	6.86	0.857

*PSA: prostate specific antigen.

Table 2: D'Amico risk classification of groups.

Preoperative	Low risk	Intermediate risk	High risk
Group I (n=15)	4	7	4
Group II (n=15)	7	6	2

Only one patient in Group I had a positive surgical margin (PSM), which was spotted on the bladder neck. MRI predicted 93.3% of the primary tumour localisation in comparison to the final pathology of the specimens. After the final pathology, extracapsular extension (pathologic T3) was reported in six patients from Group I and four patients from Group II (Table 3). The initial planned dissection technique was changed to the nerve-sparing technique (intrafascial or interfascial) following MRI evaluation in at least one side in 7 of the 15 patients (46.6%). An example case where the dissection plan was changed to nerve-sparing technique after performing prostate MRI is summarised with MRI and pathologic pictures in Figure 1.

Table 3: Pathologic T2 and T3 of groups.

Pathologic stage	T2	T3
Group I (n=15)	9	6
Group II (n=15)	11	4

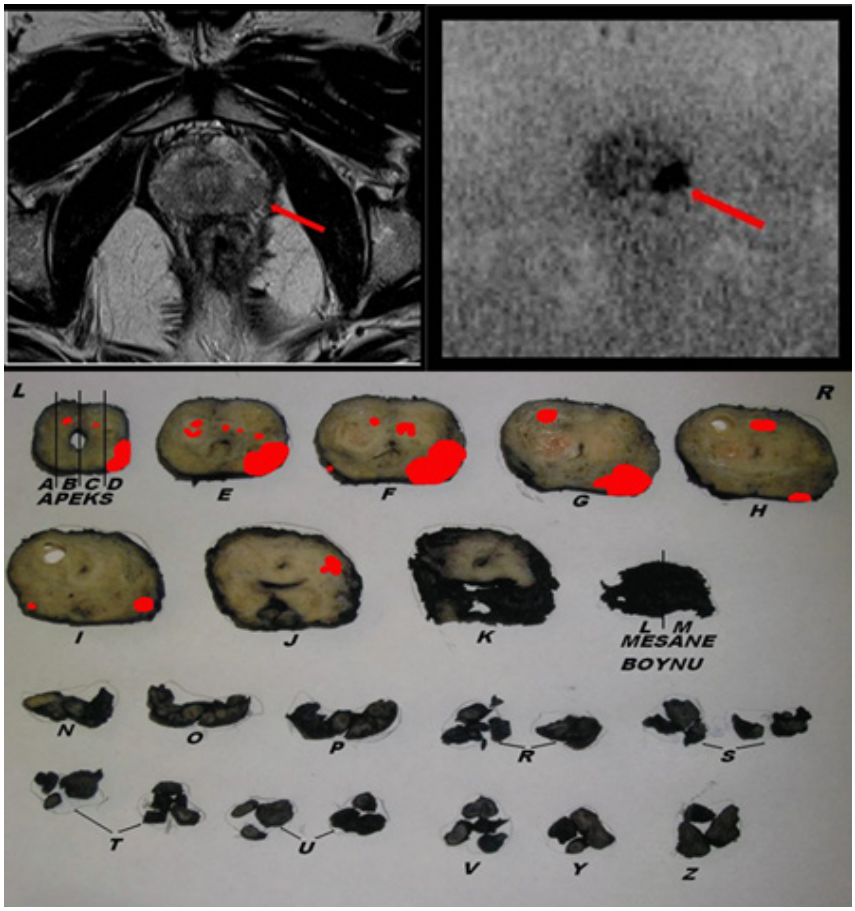

Figure 1: Example of dissection plan changed to nerve-sparing (interfascial) technique.
Images of a 58-year-old man with a prostate specific antigen (PSA) level of 6.42 ng/dL and a biopsy Gleason score (4+4=8) in two of seven cores on the right. Digital rectal examination was abnormal on the right side of the prostate. Non-nerve sparing dissection was initially planned on the right side in accordance with biopsy. Magnetic resonance imaging (MRI) showed no involvement of the neurovascular bundles or seminal vesicles but reported adjacent tumour to capsule. MRI images of T2-weighted and diffusion phase was focussed on the tumour at the right posterolateral gland (shown with arrow). Right interfascial dissection plan was performed and the final pathology demonstrated Gleason 3+4, confirming imaging findings of extracapsular extension on the right posterolateral gland although surgical margins are negative.

DISCUSSION

Radical prostatectomy is the most common treatment for clinically localised PrC and the number of RRP has been rapidly increasing since it was introduced in 2000.[11] RRP is especially popularised due to the successful achievement of the trifecta, which is described as successful control of cancer, preservation of erectile function, and continence after prostatectomy. The NVBs that mediate erectile function and continence lie posterolateral to the prostatic capsule and adjacent tissues. With the latest studies, periprostatic anatomy is better defined, and now three different dissection plans can be utilised, of which two are nerve-sparing techniques (intrafascial and interfascial).[10]

Comparative studies demonstrated perioperative and functional advantages for RRP versus open radical prostatectomy (ORP).[12,13] Surgeons performing ORP demonstrate that tactile feedback enables intraoperative decision of dissection plans for cancer control with reducing PSMs.[14] During RRP, lack of tactile feedback is the main disadvantage while dissecting the NVB and adjacent tissues around the tumour. Current specialised techniques of prostate MRI have been shown to be accurate in detecting tumour localisation and extent; thus directing the surgeon to choose the dissection plan in RRP.[2-9] In our study we prospectively followed up the patients who had RRP with or without preliminary MRI-guided dissection planning. This is the first study to our knowledge comparing the oncologic results of RRP with or without MRI-guided dissection techniques. This is a preliminary report of the data involving a limited number of patients.

In Group I patients who underwent MRI, any suspicion of extracapsular extension was the main factor that influenced the dissection plan. The planning criteria of dissection technique in Group II were digital rectal examination and the D'Amico risk classification. Magnetic resonance spectroscopy of the prostate was not performed on all patients because it is not covered by most health insurance policies and not all patients can pay this additional cost. McClure et al.[15] have reported a series of cases of MRI-guided preservation of the NVB in RRP. In their study the initial plan was changed in 28 of the 104 patients (27%) according to MRI findings, while in our study, the initial plan was changed in 7 of the 15 patients (46.6%). This higher percentage in our study may be associated with a limited study population. They also reported that in 11 of the 28 patients, surgery was changed from a nerve sparing to a non-nerve sparing technique, but in our study we did not have to change the nerve sparing to a non-nerve sparing plan on any side. In McClure's study,[15] no PSM was reported in patients where the surgical plan was changed according to MRI findings; in our study we had only one PSM at the bladder neck that was not related to NVB dissection plan. In another study by Hricak et al.,[16] MRI was used for evaluation of NVB invasion before ORP to decide on the dissection plan. They reported that the surgical plan was altered in 39% of the NVBs in their series, which is also lower than our results.[16]

Only one patient in our MRI group had a PSM at the bladder neck that was only defined as a microscopically focal area in pathology; at the 15th month follow-up period the patient also had no PSA recurrence. These findings were not related to the nerve-sparing route or area. A previous study reported a 6.7% PSM rate in patients who had undergone a more aggressive non-nerve sparing technique according to MRI findings on the affected side.[15] A comparative study reported that RRP had fewer PSM rates than ORP (13.6% versus 18.3%; odds ratio: 0.70), and RRP was associated with a lower use of additional cancer therapy within 24 months.[11] Because of the limited study group, we did not analyse statistics for a PSM but only one patient had a PSM in the MRI group and not in another group.

The specificity of prostate MRI in the differentiation of T2 disease from T3 in some previous studies was reported in the range of 73%,[17] 89%,[18] 95%,[19] and 97.5%.[15] Our results showed a 93% specificity for the primary tumour extension and localisation. One patient had focal cancer on one side in the final pathology but MRI could not define it before the operation. In a previous study, it was reported that the positive predictive value of multi-parametric MRI for extra-capsular extension was best in intermediate and high-risk groups;[18] in conclusion they recommended that in high-risk cases, MRI might be useful for decreasing the risk of PSM when performing non-nerve sparing prostatectomy.

Final pathology reports were highly concordant with MRI-reported primary lesions. Other smaller cancer foci (usually <5 mm) reported in the final pathology were not detected and reported with

the MRI in our series. Previous studies also concluded that prostate MRI highly correlated with final pathology in the intermediate and high-risk groups of patients.[15,18] The functional results of the two groups were not reported in this paper because of the limited data and short follow-up period, but we have observed earlier continence and erectile function rates in the MRI-guided operation group. In conclusion, prostate MRI is a useful tool in the surgical planning of RRP dissection choice, achieving the ultimate trifecta without compromising the oncological outcome.

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LEARNING CURVE OF ROBOTIC RADICAL PROSTATECTOMY

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ABSTRACT

Introduction: Prostate cancer (PrC) is the fifth most common malignancy worldwide and the second most common malignancy in men. Currently, robotic-assisted laparoscopic radical prostatectomy (RARP) has become a popular treatment for localised PrC treatment worldwide. We aimed to assess the learning curve of RARP in our institution.

Methods: A total of 391 patients who underwent RARP in our clinic between February 2009 and April 2013 were included in the study. We retrospectively evaluated patient data that were recorded prospectively. The demographic, perioperative, postoperative functional, and oncological results of six surgeons' patient groups (n=72, n=110, n=103, n=38, n=36, and n=32) and three consecutive series formed by dividing the patient groups of the three surgeons with the highest volume of cases were analysed.

Results: There was no significant difference between patient groups with regard to age, American Society of Anesthesiologists score, preoperative International Prostate Symptom Score, International Index of Erectile Function (IIEF) score, number of previously performed operations, prostate-specific antigen levels, clinical stage, biopsy pathology, pathological stage, positive surgical margin (PSM) rate, biochemical recurrence (BCR) rate, potency, and continence rate at postoperative Month 12. When we assessed the three consecutive series of the three highest-volume surgeons we found that, over time, operation time (OT) decreased significantly ($p<0.001$), blood transfusion rate decreased significantly ($p=0.015$), estimated blood loss (EBL) decreased ($p>0.05$), and median IIEF score at 12 months improved significantly ($p<0.001$) in the series of Surgeon 1; OT decreased significantly ($p<0.001$), EBL decreased ($p>0.05$), and median IIEF score at 12 months improved significantly ($p=0.01$) in the series of Surgeon 2; OT decreased significantly ($p<0.001$), EBL decreased significantly ($p<0.001$), and PSM rate decreased and median IIEF scores at 12 months improved ($p>0.05$ for both) in the series of Surgeon 3. The overall complication rate was 11.7% and 34% of these complications were major ones. The overall blood transfusion rate was 2%. The overall PSM rate was 20.4% (9.3% for pT2 tumours and 44% for pT3 tumours). The overall rate of BCR was 9.4%.

Conclusion: In our clinical experience, OT, EBL, and blood transfusion rate seem to decrease during the learning curve of RARP.

Keywords: Prostate cancer, robotic-assisted laparoscopic radical prostatectomy (RARP), prostate-specific antigen (PSA), positive surgical margin (PSM) rate.

INTRODUCTION

Prostate cancer (PrC) is the fifth most common malignancy worldwide and the second most common malignancy in men.[1] In Turkey, PrC is the second most common type of cancer following lung cancer.[2] In men with localised PrC and a life expectancy >10 years, the 'gold standard' treatment option is radical prostatectomy (RP). Currently, minimally invasive techniques are improving and are becoming more preferable for surgeons, as well as for patients. Laparoscopic radical prostatectomy (LRP) and, subsequently, robotic-assisted laparoscopic radical prostatectomy (RARP) have become attractive treatment modalities for urologists and patients in Europe and the USA. RARP was first performed by Binder and Kramer in 2000.[3] Currently, it is the most common technique for RP in the USA and the numbers are growing in Europe.[4]

We have been performing RARP in our hospital since February 2009. The learning curve is an important factor in surgical procedures that have many variables. Patel et al.[5] reported the learning curve of RARP as 25 cases. In this study we evaluated the learning curve of RARP in our institution.

METHODS

Overall, 391 patients who underwent RARP in our clinic between February 2009 and April 2013 were included in the study. Patients with missing data, those lost to follow-up, and data from surgeons who had performed <5 procedures were excluded.

We retrospectively analysed the data that were prospectively recorded. There were six surgeons and the patients were divided into six groups according to the surgeon (Group 1: n=72, Group 2: n=110, Group 3: n=103, Group 4: n=38, Group 5: n=36, Group 6: n=32). Surgeons 1, 2, and 3 performed the highest volume of procedures and their cases were also examined as three consecutive series in order to evaluate improvement over time. Surgeon 1's three series each included 24 patients, Surgeon 2's three series included 37, 37, and 36 patients, and Surgeon 3's three series included 35, 34, and 34 patients. Demographic, perioperative, postoperative functional, and oncological results were analysed.

PrC was diagnosed by transrectal ultrasound-guided needle biopsy following transurethral prostatectomy and open prostatectomy. Perioperative and short-term post-operative data were recorded. Preoperative data included patient age, body mass index (BMI), serum prostatespecific antigen (PSA) level, Gleason score (GS), clinical stage, American Society of Anesthesiologists (ASA) score, International Prostate Symptom Score (IPSS), and International Index of Erectile Function (IIEF) score. Perioperative data included operation time (OT), anastomosis time, estimated blood loss (EBL), blood transfusions, and complications. Postoperative data included complications and pathological results including margin status, biochemical recurrence (BCR), continence, and potency status. For potency, Questions 1-5 and 15 of the IIEF questionnaire were used. We considered the use of 0-1 pads as continent, 2 pads as mild incontinence, and >2 pads as severe incontinence. Clinical staging was performed according to the 2002 TNM classification.

All operations were performed using the transperitoneal five-port technique. We used the da Vinci S™ surgical robot (Intuitive Surgical, Inc., Sunnyvale, California, USA) in our operations. Nerve sparing was applied to all patients with clinical stage T1-T2a and GS <7, as well as selected patients with clinical stage T2b-T2c and GS >8.

Statistical Analysis

Statistical analysis was performed using the SPSS program for Windows 11.5 (SPSS, Chicago, Illinois, USA) and by applying the one-way ANOVA, Kruskal–Wallis test, post-hoc Tukey's test, Conover's practical nonparametric statistics, Pearson's chi-squared test, and Fisher's exact test. A p value <0.05 was considered statistically significant.

RESULTS

The clinical characteristics of the patients are summarised in Table 1. Patient age, total/free PSA levels, and ASA scores were similar between the different surgeon groups. Mean BMI was significantly higher in Surgeon 1's group compared with Surgeon 3's group (p=0.041), and patients in Surgeon 1's group displayed a significantly lower median prostate weight than those in the groups of Surgeons 2, 3, 5, and 6. Patients in Surgeon 4's group displayed a significantly lower mean prostate weight than those in the groups of Surgeons 2, 5, and 6 (p=0.007).

Preoperative GSs were similar between surgeon groups (p=0.906). Most of the patients had GS

3+3 PrC, with the proportion of these patients in each of surgeon groups 1-6 being 67.6%, 66.4%, 65%, 68.4%, 65.7%, and 58.1%, respectively. There was no statistically significant difference between surgeon groups in terms of clinical stage (p=0.243). Most of the patients displayed a clinical stage of T1c, with the proportion of these patients in each of surgeon groups 1-6 being 61.1%, 59.1%, 50.5%, 57.9%, 52.8%, and 40.6%, respectively. Preoperative IIEF scores and IPSS scores were also similar between the surgeon groups (p=0.350 and p=0.203, respectively).

The OT, EBL, and blood transfusion rates were compared between the surgeon groups and between the three consecutive series from the three surgeons with the highest volume of procedures. The median OTs in surgeon groups 1-6 were 215 mins (range: 90-360), 142.5 mins (range: 115-300), 137.5 mins (range: 95-275), 130 mins (range: 125-135), 110 mins (range: 95-115), and 125 mins (range: 95-145), respectively. The median EBLs in surgeon groups 1-6 were 150 cc (range: 40-1500), 100 cc (range: 30-1100), 100 cc (range: 20-500), 100 cc (range: 50 400), 100 cc (range: 50-800), and 100 cc (range: 20-400), respectively. The rates of blood transfusion in surgeon groups 1-6 were 8.3%, 0.9%, 0%, 0%, 2.8%, and 0%, respectively.

The rates of complications in surgeon groups 1-6 were 20.8%, 16.4%, 8.7%, 2.6%, 5.6%, and 3.1%, respectively. The overall complication rate was 11.7%. 34% of the complications were major and 66% of them were minor ones. Postoperative GS and positive surgical margin (PSM) rates were similar between surgeon groups (p=0.133 and p=0.177, respectively). The rates of BCR in surgeon groups 1-6 were 6.9%, 14.5%, 7.8%, 5.3%, 8.3%, and 9.4%, respectively, with no statistically significant difference (p=0.439). The 12-month continence rates of surgeon groups 1-6 were 94.4%, 99.1%, 96.1%, 97.3%, 91.7%, and 93.5%, respectively, with no statistical significant difference (p>0.05). The overall potency rate at 12 months was 53.4% and the overall continence rates at 3 months and 12 months were 60% and 94.8%, respectively.

Table 1: Patient characteristics according to surgeon groups.

Patient group	Age, years	BMI	t-PSA	f-PSA	Prostate weight, g	ASA 1/2/3
Surgeon 1 (n=72)	62.4±6.3	27.3±3.4[a]	6.5 (1.4-32.0)	1.06 (0.07-6.40)	48.5 (18-100)[a,b,c,d]	4/63/5
Surgeon 2 (n=110)	61.0±6.8	26.5±1.9	7.6 (1.1-78.0)	1.09 (0.03-14.30)	55 (20-112)[b,e]	9/101/0
Surgeon 3 (n=103)	61.6±5.6	26.3±1.4[a]	6.9 (1.2-170.0)	1.02 (0.04-5.98)	52 (30-140)[a]	12/91/0
Surgeon 4 (n=38)	60.9±6.8	26.5±1.4	6.6 (0.4-21.0)	1.00 (0.10-7.36)	46 (25-115)[e,f,g]	1/36/1
Surgeon 5 (n=36)	62.8±7.1	26.8±1.5	5.8 (2.2-30.0)	0.97 (0.62-5.20)	60 (22-105)[c,f]	5/31/0
Surgeon 6 (n=32)	62.7±5.8	26.8±1.2	10.0 (0.3-45.0)	1.26 (0.57-4.26)	60 (27-130)[d,g]	3/29/0
p value	0.460*	0.041*	0.051**	0.150**	0.007**	0.051**

*One-way ANOVA; **Kruskal–Wallis test; [a]Statistically significant difference between Surgeon 1 and Surgeon 3 groups (p<0.05); [b]Statistically significant difference between Surgeon 1 and Surgeon 2 groups (p=0.005); [c]Statistically significant difference between Surgeon 1 and Surgeon 5 groups (p=0.006); [d]Statistically significant difference between Surgeon 1 and Surgeon 6 groups (p=0.004); [e]Statistically significant difference between Surgeon 2 and Surgeon 4 groups (p=0.046); [f]Statistically significant difference between Surgeon 4 and Surgeon 5 groups (p=0.028); [g]Statistically significant difference between Surgeon 4 and Surgeon 6 groups (p=0.018).
BMI: body mass index; t-PSA: total prostate-specific antigen; f-PSA: free prostate-specific antigen; ASA: American Society of Anesthesiologists score.

Table 2: Perioperative outcomes and PSM rates of the three surgeons with the highest surgical volume.

Outcome	Series 1	Series 2	Series 3	p value
OT				
Surgeon 1	227.5 (90-380)[a]	215 (130-320)[b]	122.5 (100-280)[a,b]	<0.001*
Surgeon 2	155 (115-300)[a,c]	120 (95-176)[c]	120 (95-155)[a]	<0.001*
Surgeon 3	120 (105-275)[a]	131 (100-172)[b]	110 (95-165)[a,b]	<0.001*
EBL				
Surgeon 1	215 (40-1000)	125 (40-400)	150 (50-1500)	0.260*
Surgeon 2	150 (30-500)	100 (50-1100)	100 (50-1000)	0.596*
Surgeon 3	150 (50-500)[a,c]	100 (50-300)[b,c]	50 (20-500)[a,b]	<0.001*
Blood transfusion				
Surgeon 1	5 (20.8%)[c]	0 (0.0%)[c]	1 (4.2%)	0.015**
Surgeon 2	0 (0.0%)	0 (0.0%)	1 (2.8%)	0.324**
Surgeon 3	0 (0.0%)	0 (0.0%)	0 (0.0%)	-
PSM				
Surgeon 1	3 (12.5%)	5 (20.8%)	3 (12.5%)	0.662**
Surgeon 2	10 (27.0%)	8 (21.6%)	12 (33.3%)	0.532†
Surgeon 3	7 (20.0%)	7 (21.2%)	5 (14.7%)	0.766†
pT2 – PSM				
Surgeon 1	0 (0.0%)	0 (0.0%)	1 (4.2%)	0.329**
Surgeon 2	5 (13.5%)	5 (13.5%)	1 (2.8%)	0.152**
Surgeon 3	3 (8.6%)	0 (0.0%)	2 (5.9%)	0.121**
pT3 – PSM				
Surgeon 1	3 (12.5%)	5 (20.8%)	2 (8.3%)	0.448**
Surgeon 2	5 (13.5%)	3 (8.1%)[b]	11 (30.6%)[b]	0.033†
Surgeon 3	4 (11.4%)	6 (18.2%)	3 (8.8%)	0.505**

*Kruskal–Wallis test; **Likelihood-ratio test; †Pearson's chi-squared test; [a]Difference between Series 1 and Series 3 is statistically significant (p<0.01); [b]Difference between Series 2 and Series 3 is statistically significant (p<0.05); [c]Difference between Series 1 and Series 2 is statistically significant (p<0.05).
OT: operation time; EBL: estimated blood loss; PSM: positive surgical margin.

The three consecutive series of the surgeons with the highest volume of cases (Surgeons 1, 2, and 3) were compared with regard to OT, EBL, blood transfusion rate, and PSM rate (Table 2). In the three series of Surgeon 1, OT decreased significantly between consecutive series (p<0.001). In the three series of Surgeon 2, OT decreased significantly between the first and second series, although not between the second and third series (p<0.001). In the three series of Surgeon 3, OT decreased significantly between the second and third series. EBL decreased significantly in each consecutive series of Surgeon 3 (p<0.001), whereas EBL in the consecutive series of Surgeons 1 and 2 displayed a trend towards being lower in the second and third series compared with the first series, although this failed to reach statistical significance (p>0.05). The blood transfusion rate was significantly higher in Surgeons 1's first series compared with the second and third series (p=0.015). Overall, PSM rates did not change significantly in any of the three surgeons' series, although the rate in Surgeon 2's third series was significantly higher than in the second series with regard to pT3 stage tumours.

The median IIEF scores of Surgeon 1's group at 12 months were 13 (range: 6-26) for the first series, 6 (range: 6-24) for the second series, and 21 (range: 6-25) for the third series, which showed a significant improvement in the third series

(p<0.001). The median IIEF scores of Surgeon 2's group at 12 months were 6 (range: 6-26) for the first series, 18 (range: 6-26) for the second series, and 18 (range: 6-28) for the third series, which showed a significant improvement in both the second and third series (p=0.01). The median IIEF scores of Surgeon 3's group at 12 months were 19 (range: 6-26) for the first series, 16 (range: 6-25) for the second series, and 20 (range: 6-28) for the third series, which showed no statistically significant difference between series (p>0.05). The continence rates for Surgeon 1's group at 12 months were 95.8%, 83.3%, and 100% for the first, second, and third series, respectively. The continence rates for Surgeon 2's group at 12 months were 100%, 97.3%, and 100% for the first, second, and third series, respectively. The continence rates of Surgeon 3's group at 12 months were 91.4%, 100%, and 97% for the first, second, and third series, respectively. The 12-month continence rate of Surgeon 1's group was significantly lower in the second series than in the first and third series (p=0.017), but there was no significant difference in the series of Surgeon 1 and Surgeon 2 (p>0.05).

DISCUSSION

RARP has become a frequently applied surgical modality in the treatment of localised PrC. RARP is both a well-tolerated and quick-to-learn procedure relative to LRP.[6] Patel et al.[5] reported that 25 cases are required in order to complete the learning curve of RARP. In fact, every individual has his/her own learning curve and the number of cases needed to become proficient varies.

In our study, BMI was significantly higher in Surgeon 1's patient group than Surgeon 2's group. Agarwal et al.[7] and Gumus et al.[8] reported BMI values similar to those in our study. Prostate weight was significantly different between the surgeon groups in our study. The patient groups of Surgeon 1 and Surgeon 4 had significantly lower prostate weights compared with the other groups. Median prostate weight ranged between 46-60 g when considering all the surgeons' patient groups. Agarwal et al.[7] and Sharma et al.[9] reported similar mean prostate weights in their studies.

In our study, we divided the three surgeon groups with the highest number of cases into three consecutive series in order to evaluate parameters related to the learning curve. The OT, EBL, and blood transfusion and PSM rates were compared between the three consecutive series in each of these three surgeon groups. The OT decreased significantly in the third series of Surgeon 1 (after 48 cases), in the second series of Surgeon 2 (after 74 cases), and in the third series of Surgeon 3 (after 69 cases).

Doumerc et al.[10] reported that a surgeon with experience of 2,000 open RP procedures had to perform 110 RARP procedures in order to be able to complete it in <3 hours. On the other hand, Gumus et al.[7] reached 168 minutes after the first 40 cases. Therefore, our results seem to be similar with these previous studies. EBL is another important parameter in the evaluation of the learning curve. Stolzenburg et al.[11] reported EBL as 254 cc during their learning curve. In our study, EBL was 150 cc in Surgeon 1's series and 100 cc in both the other surgeons' series. We did not detect a significant decrease in EBL, except in Surgeon 3's consecutive series. The blood transfusion rate has been reported by other groups as being 17%[12] and 2.2%.[7] The blood transfusion rate in our study was 2%. Surgeon 1's group had a higher blood transfusion rate compared with the groups of Surgeon 2 and Surgeon 3. Overall, EBL and blood transfusion rates in our study were in accordance with the published literature. Furthermore, our total complication rate of 11.7% was similar to those reported in larger studies.[7]

The primary goal of all RP techniques is to eradicate the disease. Therefore, the PSM rate is also very important. Even during the learning curve, the PSM rate should be at least 'acceptable'. Villamil et al.[13] reported an overall PSM rate of 21% in their series of 300 patients (16.6% in pT2 and 27.7% in pT3 disease); dividing these patients into three groups of 100 gave chronological PSM rates of 28%, 20%, and 16%. Our overall PSM rate was 20.4%, with a rate of 9.3% in pT2 patients and a rate of 44% in pT3 patients. Although we did not detect a significant decrease in the three series, there was an increase in Surgeon 2's series. We think this may be because our surgeons are still on the learning curve in terms of PSM, and some researchers suggest that the 'tipping point' for reducing PSM rates takes longer than for other parameters.[10,14] Another important parameter for disease-free survival is BCR. Our BCR rate was 9.4%, which is similar to previous studies.[7-15]

Although curative treatment is important in PrC surgery, maintenance of quality of life and patient satisfaction in terms of preserving potency and

continence are also important. Tholomier et al.[16] reported that the potency rate for all 722 men in their study was 52% at 12 months. In another study that reports their learning curve, the potency rate at 18 months was 70.7%.[17] Our overall potency rate at 12 months was 53.4%, which was comparable to previous studies. Finally, median IIEF scores at 12 months were significantly improved in the third series of Surgeon 1 and Surgeon 2. In previous studies, continence rates at 3 months were 59.7-65% and were 59-92.5% at 12 months.[7,9,11,18] Our overall continence rates at 3 months and 12 months were 60% and 94.8%, respectively, which are comparable to previously published studies.

CONCLUSION

There were significant improvements in OT, EBL, and blood transfusion rates with increasing surgeon experience. There was not a significant change in PSM rates. The OT, EBL, blood transfusion rates, overall complication rates, PSM rates, BCR rates, continence, and potency rates were all similar to previously published studies of RARP. Therefore, RARP can be performed relatively safely even in the learning curve period and the outcomes improve with experience.

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OUTCOMES OF ROBOTIC RADICAL PROSTATECTOMY IN HIGH-RISK PROSTATE CANCER PATIENTS: EXPERIENCE IN 60 PATIENTS WITH ONCOLOGICAL AND FUNCTIONAL OUTCOMES

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ABSTRACT

Introduction: In this retrospective study, we report outcomes of robot-assisted laparoscopic radical prostatectomy (RARP) in high-risk prostate cancer (HRPC), classified according to the D'Amico risk criteria and with a minimum follow-up of 1 year.

Methods: A total of 60 patients who had at least one preoperative HRPC feature and underwent RARP were included. Mean patient age and preoperative serum prostate-specific antigen level were 66.4±7.5 years and 13.4±11.0 ng/ml, respectively. Preoperatively, 3 (5.0%), 4 (6.7%), 17 (28.3%), 3 (5.0%), and 33 (55.0%) patients had prostate biopsy-proven Gleason scores of 5+4, 4+5, 4+4, 3+5, and <8, respectively. Bilateral neurovascular bundle (NVB)-sparing, unilateral NVB-sparing, and non-NVB-sparing surgery were performed in 44 (73.3%), 3 (5.0%), and 13 (21.7%) patients, respectively.

Results: Mean console time, intraoperative blood loss, duration of hospital stay, and urethral catheter removal time were 159.7±62.4 minutes, 210±201.9 ml, 3.9±1.9 days, and 10.9±5.3 days, respectively. During the perioperative period (Days 0-30), 7 minor and 5 major complications occurred as categorised using the modified Clavien classification. No complications were detected during postoperative Days 31-90. Postoperative pathological stages included pT0, pT2a, pT2b, pT2c, pT3a, and pT3b disease in 2 (3.3%), 8 (13.3%), 4 (6.7%), 14 (23.3%), 18 (30.0%), and 14 (23.3%) patients, respectively. The positive surgical margin rate was 26.7% and mean lymph node yield was 11.8±8.3 (range: 3-37). Mean follow-up was 27.8±11.1 months. Biochemical recurrence was detected in 13 (21.7%) patients. Of the total 60 patients, 26 (43.3%) were fully continent (0 pad/day), 15 (25.0%) wore a safety pad/day, 10 (16.7%) wore 1 pad/day, 5 (8.3%) wore 2 pads/day, and 4 (6.7%) wore >2 pads/day. Of the 27 patients with no preoperative erectile dysfunction (ED), 17 (63.0%) had no ED at a mean follow-up of 1 year. Trifecta and pentafecta rates were 43.2% and 28.7%, respectively.

Conclusion: Based on our experience, RARP in HRPC is a relatively safe procedure with satisfactory oncological and functional outcomes.

Keywords: Robotic radical prostatectomy, high-risk prostate cancer, outcomes, minimally invasive surgery, robotic surgery.

INTRODUCTION

Prostate cancer (PrC) is the most common solid-organ cancer and a significant aetiology of cancer-associated death in the male population.[1] Between 15-30% of patients diagnosed with PrC have high-risk, non-metastatic disease.[2,3] The D'Amico risk-stratification system classifies non-

metastatic PrC into low, intermediate, or high-risk PrC according to initial serum prostate-specific antigen (PSA) level, clinical T stage, and biopsy-proven Gleason score (GS). High-risk PrC (HRPC) was classified as having any one of the following features: PSA >20 ng/ml, clinical T stage ≥T2c according to the American Joint Committee on Cancer criteria published in 1992, or Gleason 8-10 disease.[4] The prognostic importance of preoperative PSA levels, clinical stage, and biopsy-proven GS is well known and previously verified.[5] Treatment of HRPC includes a multimodality approach, including a combination of surgery, radiation therapy (RT), and androgen deprivation therapy (ADT).[6-8]

Management of HRPC needs aggressive treatment or a multimodal therapy.[9] The outcomes of the Swedish Registry Study showed that, for HRPC, the patient group receiving surgery displayed longer cancer-specific survival than the RT group.[10,11] On the other hand, some reports favour the use of RT with ADT.[12] The definitive treatment should be individualised according to the patient. Although open radical prostatectomy (RP) is the standard technique in the surgical management of patients with PrC, the robotic approach has come to dominate contemporary practice worldwide.[13,14] However, the number of publications related to the use of robotic surgery in HRPC is very limited. We have previously published results from our initial robot-assisted radical prostatectomy (RARP) case series in HRPC.[15] In the current study, we report mid-term functional and oncological results from our contemporary RARP case series in HRPC.

METHODS

Between February 2009 and February 2015, we performed 678 RARP procedures at our institution. All the data from patients were recorded prospectively and this database was used in the current study. A total of 100 patients were classified as HRPC according to D'Amico risk criteria. Of the 100 patients with HRPC, 60 had at least 1 year of follow-up and were included in the current retrospective study.

In our case series, all patients were operated on using a da Vinci-S four-arm surgical robot (Intuitive Surgical, Sunnyvale, California, USA). Overall, five surgeons performed RARP on HRPC patients. We previously described in detail the surgical technique that we applied, as well as the pre and postoperative follow-up of the patients upon whom we performed RARP.[16] Mean patient age and preoperative serum PSA were 66.4±7.5 years and 13.4±11.0 ng/ml, respectively. Pelvic lymph node (LN) dissection was performed in patients who had >5% of LN involvement probability according to Partin's tables. Biochemical recurrence (BCR) was defined as two consecutive serum PSA levels of >0.2 ng/ml. Statistical analyses were performed using the chi-squared test in SPSS version 22.0 (SPSS, Chicago, Illinois, USA).

RESULTS

Preoperatively, 3, 4, 17, 3, and 33 patients had a prostate biopsy GS of 5+4, 4+5, 4+4, 3+5, and <8, respectively.

Mean console time, intraoperative blood loss, duration of hospital stay, and urethral catheter removal time were 159.7±62.4 minutes, 210±201.9 ml, 3.9±1.9 days, and 10.9±5.3 days, respectively (Table 1). Bilateral neurovascular bundle (NVB)-sparing, unilateral NVB-sparing, and non-NVB-sparing surgeries were performed in 44 (73.3%), 3 (5.0%), and 13 (21.7%) patients, respectively.

During the perioperative period (Days 0-30), 7 minor complications (urinary tract infection that required hospitalisation [n=2], constipation [n=2], anastomotic urinary leakage [n=2], intra-abdominal bleeding that required transfusion without causing abdominal haematoma [n=1]), and 5 major complications (bladder perforation that was repaired intraoperatively [n=4], postoperative 1-day intensive care unit requirement [n=1]) occurred as categorised using the modified Clavien classification. No complication was detected during postoperative Days 31-90.

Postoperative pathological stages included pT0, pT2a, pT2b, pT2c, pT3a, and pT3b disease in 2, 8, 4, 14, 18, and 14 patients, respectively (Table 2). The overall positive surgical margin (PSM) rate was 26.7%, and the mean LN yield was 11.8±8.3 (range: 3-37). Mean follow-up was 27.8±11.1 months. A total of 13 patients experienced BCR. Of the total 60 patients, 26 (43.3%) were fully continent (0 pad/day), 15 (25.0%) wore a safety pad/day, 10 wore (16.7%) 1 pad/day, 5 (8.3%) wore 2 pads/day, and 4 (6.7%) wore >2 pads/day. Of the 27 patients with no preoperative erectile dysfunction (ED), 17 (28.3%) had no ED at a mean follow-up of 1-year. Trifecta and pentafecta rates were 43.2% and 28.7%, respectively.

Table 1: Operative parameters.

Parameter	Value
Mean surgery (console) time, min	159.7±62.4
Mean Intraoperative blood loss, ml	210±201.9
APAs detected and preserved, n (%)	
Overall	5 (8.3)
Unilateral	4 (6.7)
Bilateral	1 (1.7)
NVB-preserving technique, n (%)	
Bilateral	44 (73.3)
Unilateral	3 (5.0)
Not performed	13 (21.7)
Mean lymph node yield	11.8±8.3 (range: 3-37)

APA: accessory pudetal artery; NVB: neurovascular bundle.

Table 2: Post-operative pathological outcomes.

Pathological stage	Frequency, n (%)
ASAP+HGPIN	0
pT0	2 (3.3)
pT2a	8 (13.3)
pT2b	4 (6.7)
pT2c	18 (30.0)
pT3a	14 (23.3)
pT3b	14 (23.3)
Gleason score	
2-6	15 (25.0)
3+4	11 (18.4)
4+3	17 (28.3)
8-10	15 (25.0)
T0	2 (3.3)
PSM rate	
Overall	16 (26.7)
pT2	4 (6.7)
pT3	12 (20.0)

ASAP: atypical small acinar proliferation; HGPIN: high-grade prostatic intraepithelial neoplasia; PSM: positive surgical margin.

DISCUSSION

Within the published literature, experience with RARP in HRPC is limited. In this study we evaluated the outcomes of our RARP experience in 60 HRPC patients. In our case series, mean intraoperative blood loss was 210 ml. Similar to our study, Punnen et al.[17] reported mean intraoperative blood loss as 217 ml in a series of 233 HRPC patients who underwent RARP. Mean length of hospital stay was 3.9 days in our series, which is longer than some previously reported series.[17,18]

In our case series, 34 patients (56%) underwent extended pelvic lymph node dissection (ePLND) and mean LN yield was 11.8±8.3. Two patients had LN metastasis. We performed bilateral ePLND in those with an at least 5% risk of pelvic LN involvement by PrC according to Partin's tables.[19] The PSM rate was 26.7% in our series. Pierorazio et al.[20] reported a PSM rate of 8.3% in pT2 disease,[20] and Gandaglia et al.[18] reported a PSM rate of 60% in pT2 and pT3a disease. Others reported overall PSM rates between 12-48.8%.[11,19,20-23] Our PSM rates seem to be similar to the published literature.

In our series, the mean follow-up was 27.8±11.1 months and BCR was detected in 13 patients (21.7%), which are similar to results reported by Punnen et al.[17] Busch et al.[21] reported BCR as 41.4% after 3 years of follow-up. Of the 60 patients, 6 (10.0%) received adjuvant RT (ART) alone, 6 (10.0%) received hormone blocking treatment (HT) alone, and 8 (13.3%) received ART+HT postoperatively. Gandaglia et al.[18] reported that 21.2% of 353 HRPC patients who underwent RARP required additional cancer therapy after surgery. Of those, 15.9% required RT and 13.9% required ADT.[18] Currently, the mean follow-up time is limited in our series and the need for additional therapy might change as the follow-up time increases.

In our case series and during the perioperative period (Days 0-30), 7 minor and 5 major complications occurred as categorised using the modified Clavien classification. No complications were detected during postoperative Days 31-90. Other authors reported complication rates between 4-30% in HRPC patients who underwent RARP.[22-25]

The functional outcomes following RARP are urinary continence and erectile function. Currently, the information about functional outcomes following RARP in HRPC patients is limited in the literature. Yuh et al.[26] reported 1-year urinary continence rates (0-1 safety pad/day) between 78-95% and erectile function recovery rates between 52-60%. Yee et al.[27] reported their

1-year pad-free continence rate as 84% in HRPC patients who underwent RARP. Preoperative erectile function status of the patient, postoperative adjuvant treatment requirement, NVB-sparing (unilateral or bilateral), bladder neck preservation, and urethral length should all be considered seriously in the evaluation of postoperative functional outcomes. Limited sample size, inclusion of more than one surgeon's experience, and being a retrospective and non-comparative study are the main limitations of our study.

In conclusion and according to our experience, RARP in HRPC is a relatively safe procedure with satisfactory oncological and functional outcomes in both the short and mid-term.

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PERCUTANEOUS NEPHROLITHOTOMY AND COMPLICATIONS: OUR EXPERIENCE WITH 3,003 CASES

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ABSTRACT

We report the outcomes of 3,003 percutaneous nephrolithotomy (PCNL) procedures performed in our institution between March 1998 and December 2014. The PCNL procedures were performed under general anaesthesia. The ureteral catheter was installed in the supine position during cystoscopy under C-arm fluoroscopy guidance and, after turning the patient into the prone position, the kidney with stone was entered with a metal needle under fluoroscopy. The Amplatz renal dilator set was used (dilation or balloon renal dilator). The nephrostomy catheter was placed in the renal sheath. After completion of PCNL procedures, residual asymptomatic stones of 4 mm or less in size were considered clinically insignificant. Of the total number of patients, 2,699 (89.88%) achieved stone clearance. Bleeding requiring transfusion occurred in 186 cases (6.19%), of which 14 (0.47%) were treated with embolisation angiography. A double-J stent was inserted in 158 patients (5.26%). Pneumothorax occurred in 24 patients (0.80%) and colon perforation occurred in one patient (0.03%). In angiography, the bleeding site was not identified in one patient and open repair was performed. Mean duration of hospitalisation was 3.3 days and the nephrostomy tube was kept for a mean duration of 2.6 days.

Keywords: Percutaneous nephrolithotomy (PCNL), nephrolithotomy, complications.

INTRODUCTION

The incidence of urolithiasis varies according to age and geographical region, and is of particular concern in developing countries. With the introduction of percutaneous nephrolithotomy (PCNL) in 1976, open surgical approaches have begun to lose their popularity in the treatment of urolithiasis.[1] Although PCNL has been accepted as a minimally invasive treatment modality, the technique can lead to possible complications, including bleeding and injury to the collection system.[2] In this retrospective study we report our experience with PCNL and evaluate the clinical outcomes, including morbidity and mortality.

MATERIALS AND METHODS

This retrospective study was conducted in a single urology clinic and reviewed the medical data of 3,003 patients (3,003 renal units) up to the age of 80 years who underwent PCNL between March 1998 and December 2014. Preoperative patient histories, physical examinations, and routine laboratory tests including blood biochemistry, urinalysis, and urine cultures were evaluated. An abdominopelvic ultrasound, plain abdominal films, and intravenous urography were used as diagnostic imaging tools to determine stone size, location, and anatomical clues, as well as for planning treatment. Computed tomography was used in patients suspected of having renal abnormalities, allergies to the contrast medium, and the presence of a retro-renal colon, and also in patients with a non-opaque stone. Patients with sterile urine underwent PCNL with antibiotic prophylaxis. Patients with urinary infections were operated on following treatment with an antibiotic prescribed after urine culture and sensitivity tests.

After the placement of a ureteral catheter via cystoscopy in the lithotomy position under

general anaesthesia, the patient was placed in a prone position. PCNL access was gained using an 18-G needle and a guide wire passed from inside, under biplanar fluoroscopic guidance. Using Amplatz dilators, the percutaneous tract was dilated up to 30 Fr for the 24 Fr nephroscope (Karl Storz, Germany) and up to 30 Fr for the 24 and 26 Fr adult-type nephroscopes (Karl Storz, Germany), according to the patient's age, caliceal dilatation, and the size of the stone(s). Following the breakage of the stones using a pneumatic lithotriptor (Swiss LithoClast®), a 14-22 Fr Malecot or Foley catheter was placed into the renal tract. On the first postoperative day, plain abdominopelvic radiography and antegrade pyelography (if needed) were used to assess stone clearance and to detect any pathology of the pelvicalyceal system that occurred during surgery. Stone pieces that appeared smaller than 4 mm on plain X-ray were accepted as clinically insignificant residual fragments. Stone burden and location, number, size and location of the renal tract, types of instruments, complications, stone clearance, duration of nephrostomy, and hospitalisation time were recorded as pre and postoperative factors. Patients with missing data were excluded from the study.

RESULTS

Of the 3,003 cases, we achieved complete stone clearance in 2,699 (89.88%). When complications were evaluated: bleeding requiring transfusion occurred in 186 patients (6.19%), of which 14 cases (0.47%) required angioembolisation; a double-J stent was inserted in 158 patients (5.26%), and in 40 patients (1.33%) this was inserted because of urinoma formation; pneumothorax occurred in 24 patients (0.80%); and in one patient (0.03%) colon perforation occurred. Horseshoe kidney abnormality was present in the patient with colonic perforation. In angiography, the bleeding site was not identified in one patient and open repair was performed. Mean duration of hospitalisation was 3.3 days and the nephrostomy tube was kept for a mean duration of 2.6 days as shown in Table 1.

DISCUSSION

Currently, open surgery is rarely performed in the management of kidney stones, and PCNL has become a frequently applied minimally invasive surgery that leads to fewer complications, shorter durations of hospital stay, and reduced scar tissue formation.[3,4] The success rate of PCNL procedures has been reported as 72-98% in a large series published in the literature.[5-7] Segura et al.[8] reported a 98% success rate in a total of 1,000 patients who underwent PCNL in 1985, which is one of the first larger published series. The success rate in our series was 89.88% in a total of 3,003 cases.

PCNL, as a minimally invasive surgical method for the treatment of renal stones, can lead to complications including bleeding requiring transfusion, lung injury, bowel injury, major vascular injury, and sepsis. In 2011, the Working Group of the CROES PCNL Global Study evaluated complications of PCNL and the overall complication rate was reported as 2.5%. Of those, 80% were minor and 20% were major complications. Fever and bleeding were the most frequently reported complications.[9,10]

Table 1: Percutaneous nephrolithotomy (PCNL) in 3,003 cases: outcomes and complications.

Outcome/Complication (N=3,003)	Frequency, n (%)
Stone-free following PCNL	2,699 (89.88)
Bleeding requiring transfusion	186 (6.19)
Bleeding requiring angiography and embolisation	14 (0.47)
Insertion of double-J stent	158 (5.26)
Urinoma formation	40 (1.33)
Pneumothorax development	24 (0.80)
Colon perforation	1 (0.03)
Death	1 (0.03)

The overall complication rate in the present study was 12.3%, with haemorrhage being the most common complication. In our series, complex stones constituted a high percentage of cases, which might be a factor in the higher complication rate compared with the published literature.

During the PCNL procedure, one of the most important complications is the development of acute haemorrhage. The transfusion rate has been reported to be 0.5-4% and this can increase up to 20%.[2] Development of arteriovenous fistula or pseudoaneurysm can cause severe bleeding during PCNL, with a rate of 0.5%.[5] Stone burden and prolonged percutaneous surgery operation time might be factors associated with bleeding.[11] In our series, the rate of bleeding requiring transfusion (6.19%) was in accordance with the published literature. Only 0.47% of cases required angioembolisation. Injuries to the neighbouring organs including liver, spleen, colon, and small intestine can also occur, with a reported rate of 0.2%.[12]

Supra and intercostal access might be related with occurrence of lung injury and pneumothorax. In the literature, the rates of hydrothorax and pneumothorax after PCNL were reported to be 6-12%.[13] Palnizky et al.[14] reported an 8% rate of pulmonary complications in their experience. In our series, pulmonary complications occurred in 24 cases (0.80%) that were associated with intercostal and supracostal access. These complications were treated conservatively, such as by inserting a chest tube.

Lee at al.[15] reported renal pelvis laceration (0.9%), ureteral avulsion (0.2%), and urinoma formation (0.3%) in their series. In our series, we observed urinoma formation and treated this with double-J stent insertion.

Extravasation from the collecting system following PCNL, which was reported as 26%, could be treated with double-J stent insertion. Mousavi-Bahar et al.[16] reported collecting system injury in 5.2% of 671 patients. In our study, this was detected in 5.26% of cases and we applied a double-J stent. Mortality has been reported to be 0.05%-0.3% in the literature.[15,17] In our series, this complication occurred in one patient (0.03%).

CONCLUSION

In our experience, PCNL is a generally safe and effective minimally invasive surgical modality with acceptable complications and short durations of hospital stay when used for treating kidney stones.

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OUTCOMES OF SIX PATIENTS WHO WERE TREATED WITH SELECTIVE EMBOLISATION DUE TO ARTERIOVENOUS FISTULA FOLLOWING PERCUTANEOUS NEPHROLITHOTOMY

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ABSTRACT

Objective: Arteriovenous fistula (AVF) is a rare yet serious complication of percutaneous nephrolithotomy (PCNL). The aim of this study was to investigate the preoperative characteristics and postoperative outcomes of patients treated with single-session selective embolisation following a diagnosis of AVF after PCNL.

Methods: Data from 1,200 patients who underwent PCNL in our department between January 2008 and December 2014 were retrospectively reviewed. Overall, six patients who experienced delayed haematuria and were diagnosed with AVF formation were included. Patient characteristics, stone burden, PCNL procedure, and perioperative and postoperative parameters were evaluated.

Results: Six patients with a mean age of 52 years (range: 42-57) were admitted to hospital with delayed intermittent haematuria following PCNL. All pre-PCNL stones in these patients were staghorn in type. Four patients (66%) had multiple access. Three patients needed blood transfusion due to development of hypotension. Following the diagnosis of AVF via angiography, all six patients were treated with selective embolisation during the same session. No additional treatment was required and no complications detected.

Conclusion: AVF formation is one of the causes of delayed haemorrhage after PCNL. Multiple accesses, staghorn stones, and upper calyx entry increase the risk of bleeding and AVF formation. Patients with risk factors should be informed about delayed bleeding and possible complications of PCNL.

Keywords: Kidney stone, nephrolithotomy, delayed haemorrhage, arteriovenous fistula.

INTRODUCTION

Percutaneous nephrolithotomy (PCNL) is generally considered a relatively safe technique, offering the highest success rates after the first treatment when compared with other minimally invasive lithotripsy techniques.[1] In 1981, the initial series of PCNL was reported by Wickham et al.[2] Increasing experience and developing technology have led to decreased complication rates. However, serious complications may occur following this procedure. Bleeding requiring transfusion is one of the most important complications, and arteriovenous fistulae (AVFs) are a rare cause of bleeding seen in 1-2% of all cases.[3,4] In this study we reviewed the data of six patients who were treated with selective embolisation due to AVF following PCNL.

PATIENTS AND METHODS

Data from 1,200 patients who underwent PCNL procedures between January 2008 and December 2014 were retrospectively reviewed. Overall, six patients who were diagnosed with AVF were included in our study. Preoperative patient evaluation included history, clinical examination, serum creatinine level, complete blood count, coagulation profile, and liver function tests.

All patients were evaluated with non-contrast computed tomography (CT) before the procedures.

After the insertion of a 6 Fr open-ended ureteral catheter with cystoscopy, patients were placed in the prone position. Percutaneous renal access was established under C-arm fluoroscopic guidance through the posterolateral plane of the kidney. A one-shot single dilatation technique with Amplatz dilators was performed for tract dilatation. A 30 Fr amplatz sheet was placed. Stones were removed following fragmentation with an ultrasonic lithotripter and a 22 Fr nephrostomy tube was placed at the end of the procedure. The tube was removed after 24 hours and the patient was discharged if there were no complications. Patients with residual stones <0.4 cm after the PCNL procedure were considered as successful.

Overall, a total of six patients were admitted to our clinic with delayed intermittent haematuria following PCNL procedures. Initially, patients were evaluated with non-contrast abdomen CT. Patients with the diagnosis of AVF by superselective angiography were then treated with selective embolisation. At the end of the procedure, angiography was repeated in order to confirm the occlusion of the vessel. Patients remained in bed with vital signs monitored every 4-6 hours following the procedure. A complete blood count was regularly performed until stabilisation of the condition. All patient characteristics, including age, sex, stone type, operation time, fluoroscopy time, number of renal accesses, access site (subcostal or supracostal), calyx punctures, and number of blood transfusions were recorded. See Table 1 for patient characteristics.

RESULTS

Of the 6 patients who received selective embolisation for AVF, 4 (67%) were male and 2 (33%) were female. Mean age was 52 years (range: 42-57). There was no urinary anomaly identified among the patients. All patients had complex 'staghorn' stones. Mean operation time was 138 minutes (range: 50-300). Four patients (67%) had two accesses and two patients (33%) had one access. Entry to the lower pole was performed via subcostal puncture. Secondary entries were made into the middle and upper poles. Punctures into the middle and upper poles were always performed above the 12th rib.

None of the patients required a blood transfusion pre or perioperatively. All patients were discharged from the hospital 24 hours after surgery and patients were re-admitted to hospital following the complaint of intermittent haematuria. Mean time of haematuria development after PCNL was 4 days (range: 2-7). Four patients required blood transfusion due to haemodynamic instability; the median number of blood transfusion units was 3 (range: 2-6).

Patients were evaluated with non-contrast CT to exclude possible complications of PCNL, such as residual stone, ureteral stone, and the development of peri-renal haematoma. All patients were diagnosed with AVF development in angiography and were treated with selective embolisation during the same session. Haematuria ceased within 24 hours and none of the patients needed blood transfusion after embolisation. No second session procedure was required in any patient.

Table 1: Patient characteristics.

Patient no.	Age (years)	Sex	Stone burden	Access site and number	Urinary anomaly	Operation time (minutes)	Occurrence of postoperative haematuria
1	50	M	Staghorn	Lower calyx (1)	No	110	Day 2
2	57	F	Staghorn	Lower and upper calyx (2)	No	100	Day 6
3	52	M	Staghorn	Lower and upper calyx (2)	No	70	Day 7
4	42	M	Staghorn	Lower calyx (1)	No	50	Day 5
5	54	F	Staghorn	Middle and lower calyx (2)	No	300	Day 2
6	54	M	Staghorn	Middle and lower calyx (2)	No	200	Day 5

DISCUSSION

PCNL is a relatively safe treatment for renal stones, even for multiple and staghorn renal calculi.[1,5] However, it is an invasive procedure with a complication rate of 3-18% according to different studies.[5-7] Bleeding is one of the serious complications of PCNL. Bleeding during PCNL is generally common and considered a complication only when transfusion is required. Transfusion rates vary between 0-20%, with an overall rate of 7%.[1,8]

PCNL-related bleeding can be classified as perioperative, immediate, postoperative, or delayed.[1,9] Delayed bleeding can be noticed a few days after nephrostomy tube removal and the most common reason for delayed bleeding is an unhealed parenchymal vessel. Conservative treatment is generally sufficient in most cases.[9] Other causes of delayed bleeding are AVFs and arterial pseudo-aneurysms.[8-10] The passage of blood from the high pressure of the injured artery to an injured adjacent vein results in AVF and blood passage to the parenchyma, forming a pseudo-aneurysm.[5] These complications are rare and occur in 1-2% of all cases.[3,4] In our study, AVFs occurred in 0.5% of our series. In AVF development, the patient is usually discharged from hospital without any symptoms or signs, and returns back within days, or even within weeks, complaining of persistent mild haematuria and displaying a slow decrease in haemoglobin, or, in rare cases, hypotension or gross haematuria.[5,11] In our study, all patients were admitted to hospital with intermittent mild haematuria. Mean time to the development of delayed haematuria was 4 days after discharge, which is consistent with the literature. Hypotension was detected in three patients and blood transfusion was required.

Transfusion requirement is influenced by many factors, including operative techniques, surgeon experience, stone complexity, and patient status. Lam et al.[12] reported that improved skills and the presence of flexible nephroscopy decreased rates of blood transfusion.[5] We used a rigid nephroscope in our procedures, which is what was available in our hospital.

In some studies it was reported that multiple punctures to the kidney were associated with vascular injuries and increased blood transfusion.[13,14] In our study, 67% of the patients had multiple punctures to the kidney. El-Nahas et al.[5] reported that the success rate of selective embolisation for controlling the bleeding after PCNL was 92.3%, and 72.3% of the patients were successfully treated with a single session of embolisation.[5] In our study, all patients were treated with a single session without any complications.

Stone shape and complexity are directly related to the occurrence of severe bleeding. Meta-analysis regarding the removal of staghorn stones showed higher transfusion rates.[15] Kessaris et al.[7] reported staghorn stones in 8 of 17 patients who required embolisation. El-Nahas et al.[5] observed that staghorn stones and upper calyx punctures were significant risk factors for severe bleeding. In our study, all patients who required embolisation had staghorn stones and two of the patients (33%) had upper calyx entry, which is consistent with the literature.

CONCLUSION

AVF is a rare but severe complication of PCNL and one of the reasons for delayed bleeding. Based on our study and the published literature, multiple renal accesses, the presence of staghorn stones, and upper calyx entries might be associated with late haemorrhage and AVF formation. According to our experience, single-session selective embolisation seems to be effective and generally safe in the clinical management of AVF following PCNL. More studies with larger numbers of patients are needed to characterise the risk factors.

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EFFECTIVENESS OF FLEXIBLE URETEROSCOPY AND LASER LITHOTRIPSY IN THE MANAGEMENT OF URINARY CALCULI IN PATIENTS WITH CONGENITAL ABNORMALITIES OF THE KIDNEY AND URETER

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ABSTRACT

Introduction: We present our experience with retrograde intrarenal surgery (RIRS) in patients with calculi in congenital anomalies of the upper urinary tract.
Methods: A total of 29 patients with urinary stones and congenital anomalies of the kidney and ureter, including duplicated collecting system, horseshoe kidney (HSK), malrotated kidney, ureteropelvic junction stenosis (UPJ-S), and ectopic pelvic kidney (EPK), were treated with RIRS between January 2008 and December 2014. Success was defined as the absence of stone fragments or the presence of only asymptomatic insignificant residual fragments <3 mm.
Results: A total of 35 procedures were performed. There was UPJ-S in two of the six patients with HSK and they were both treated with endopyelotomy. There were bilateral stones in two patients with HSK and one of these was treated in two separate sessions. In the UPJ-S group, endopyelotomy and lithotripsy were simultaneously performed in all but three patients who were treated in separate sessions. There was UPJ-S in one patient with an EPK, and endopyelotomy and laser lithotripsy were performed in separated sessions. Significant residual stones were detected in four patients. No major intraoperative or postoperative complications were seen.
Conclusion: RIRS is an effective and well-tolerated treatment option in the management of urinary calculi patients with anomalous upper urinary tracts.

Keywords: Anomalous kidney, anomalous ureter, flexible ureteroscopy, urolithiasis.

INTRODUCTION

Congenital abnormalities of the urinary tract occur in approximately 3.3-11.1% of the population and account for 50% of all congenital abnormalities.[1] Commonly encountered congenital abnormalities of the upper urinary tract (kidney and ureter) include: duplicated collecting system (DCS, incidence: 1/125 live births), horseshoe kidney (HSK, 1/400 live births), malrotated kidney (MRK, 1/939 live births), ureteropelvic junction stenosis (UPJ-S, 1/800-1,000 live births), and ectopic pelvic kidney (EPK, 1/2,000-3,000 live births).[1-5] It is thought that individuals with these abnormalities have a higher susceptibility to hydronephrosis, urinary tract infection (UTI), and stone disease than individuals with normal urinary tracts.[5] For example, the incidence of urolithiasis in patients with HSK is 21-60%.[3]

The treatment options for stone disease in patients with congenital abnormalities of the upper urinary tract can be challenging. Although extracorporeal shock wave lithotripsy (ESWL) and percutaneous

nephrolithotomy (PCNL) are the most frequently used methods for managing patients with urinary stones in anomalous kidneys, these treatment modalities may be complicated in several circumstances.[6] Moreover, minimally invasive surgery, including ESWL, PCNL, and laparoscopy, may not be suitable or be contraindicated in these patients.[6]

Recent developments in flexible ureteroscopic devices, such as small-caliber actively deflectable flexible ureteroscopes, nitinol baskets, graspers, access sheaths, and holmium lasers, have promoted retrograde intrarenal surgery (RIRS), a more efficient and less morbid modality, as a reliable alternative to other treatment options in the management of patients with anomalous-system stones. There have been some studies regarding the management of patients with anomalous-system stones,[5-7] most of which have been limited to HSK and EPK. In this study we present our experience with flexible ureteroscopy and laser lithotripsy of urinary calculi in patients with congenital anomalies of the upper urinary tract.

METHODS

A total of 29 patients with upper urinary system stones and congenital abnormalities of the kidney and ureter, including DCS, HSK, MRK, UPJ-S, and EPK, were treated with flexible ureteroscopy and holmium laser lithotripsy between January 2008 and December 2014. Symptoms presented included chronic back and abdominal pain, acute renal colic, haematuria, and UTIs. A computed tomography (CT) scan was performed in all cases to determine both the type of the congenital defect and stone characteristics, including size, number, and localisation.

Initially, cystoscopy was performed for both bladder examination and detection of the anatomical locations of ureteral orifices, especially in cases with a DCS. In this study, a rigid ureteroscope was used prior to flexible ureteroscopy for two reasons: 1. to treat lower or middle ureteral stones, and 2. to reveal congenital ureteral anomalies. Having completed the cystoscopy or rigid ureteroscopy, an access sheath (Flexor ureteral access sheath 11/13 F 35 cm; Cook Medical, Bloomington, Indiana, USA) was introduced over a 0.038-inch hydrophilic guidewire. A URF-P5 flexible ureteroscope (Olympus, Tokyo, Japan) was then introduced. A holmium YAG laser (Sphinx®, Lisa Laser, 30 watts, Katlenburg-Lindau, Germany) in combination with 200 µm or 272 µm laser fibres (Lithofib® and Flexifib®, Lisa Laser, Katlenburg-Lindau, Germany) were used accordingly. After stone fragmentation, a nitinol basket (Ngage® nitinol stone extractor 2.2 Fr 115 cm basket; Cook Medical, Bloomington, Indiana, USA) was used for the removal of small stone fragments. Prior to the lithotripsy, endopyelotomy was performed in patients with UPJ-S. Endoscopically, intra-operative success was defined as extraction of all stone fragments or laser lithotripsy of all stones to fragments <3 mm. After fragmentation and removal of stones, a double-J stent (DJS) was left in place in all cases according to the type of the ureteral and renal pathology. In cases where the ureteral access sheath or flexible ureteroscope could not be advanced up to the proximal ureter due to ureteral and renal pathologies, a DJS was inserted into the ureter and the intervention was delayed for approximately 1 month. Stone clearance was assessed intraoperatively and checked postoperatively using a CT scan at 3 months. Success was defined as the absence of stone fragments or presence of asymptomatic insignificant residual fragments <3 mm. For this descriptive study, data were presented as mean ± standard deviation or as ratios.

RESULTS

A total of 35 procedures in 29 patients were included in this study (Table 1). There was UPJ-S in two of the six patients with HSK, who were both treated with endopyelotomy. While this procedure was performed together with laser lithotripsy in one session for one patient, endopyelotomy and laser lithotripsy were performed separately for the other patient. There were bilateral stones in two patients with HSK and one of these was treated in two separate sessions. In the UPJ-S group, while endopyelotomy and lithotripsy were simultaneously performed in six patients, the remaining three patients were treated in two separate sessions. There was UPJ-S in one patient in the EPK group, and endopyelotomy and laser lithotripsy were performed in separate sessions.

Operative and postoperative results are shown in Table 2. Placement of a DJS was performed in all patients except in four uneventful procedures. A ureteral access sheath was placed in 29 out of 35 procedures. The operations were completed without an access sheath in one HSK, three DCS,

and two EPK patients. No major intraoperative or postoperative complications were seen. One minor intraoperative complication (minor ureteral trauma), for which the procedure was not discontinued, was seen in a patient with EPK. Postoperative complications were detected in three patients: renal colic (in DCS), persistent haematuria (in UPJ-S), and acute pyelonephritis (in HSK); these three patients were treated conservatively. Significant residual stones were detected in four patients, all with UPJ-S. In the UPJ-S group, stenosis recurred in two of nine patients at postoperative Month 6 and this was treated with open surgery.

DISCUSSION

Duplicated Collecting System

Identification of the ureteral orifice may be difficult in a DCS, especially in complete duplication. Therefore, rigid ureteroscopy should be performed before flexible ureteroscopy. In a study of four patients with stones in a DCS and treated with RIRS, while two patients were completely stone-free for the first-session of RIRS, two patients required ancillary therapy (one as second-session RIRS and the other was referred for ESWL for residual stones).[7] The success rate in our study was 75%. Our series is the largest series containing patients with renal stones in a DCS and treated with flexible ureteroscopy.

Table 1: Patient and stone characteristics.

	DCS	HSK	MRK	UPJ-S	EPK	Overall
Patients, n	8	6	3	9	3	29
Procedures, n	8	8	3	12	4	35
Renal units, n	9	8	3	12	4	36
Sex (M/F)	4/4	5/1	1/2	7/2	0/3	17/12
Mean age, years (range)	37±8 (27-51)	36±7 (30-48)	30±3 (27-33)	34±9 (21-48)	32±10 (24-43)	34±8 (21-51)
Mean BMI, kg/m^2 (range)	26±4 (21-32)	24±3 (21-28)	20±4 (18-24)	27±3 (24-31)	26±4 (24-31)	26±4 (18-32)
Laterality, n						
Right	3	-	1	4	1	9
Left	4	4	2	5	2	17
Bilateral	1	2	-	-	-	3
Localisation, n						
Upper calyx	2	1	-	-	-	3
Middle calyx	4	2	-	-	-	6
Lower calyx	4	6	-	4	3	17
Renal pelvis	4	12	3	9	3	31
Upper ureter	2	-	-	-	-	2
Number of stones	16	21	3	13	6	59
Mean stone number, n (range)	2.2±1.3 (1-4)	2.6±1.4 (1-5)	1.3±0.6 (1-2)	1.4±0.5 (1-2)	2.0±1.7 (1-4)	2.2±1.8 (1-5)
Mean stone size, mm (range)	7.2±3.7 (3-16)	7.8±4.3 (2-16)	10.0±4.1 (4-13)	11.5±4.3 (8-22)	7.2±4.7 (2-13)	8.5±4.4 (2-22)
Mean stone burden (mm) (range)	15.6±4.8 (10-23)	20.4±8.3 (11-31)	13.3±3.2 (11-17)	16.5±5.4 (!1-27)	14.3±6.7 (10-22)	17.2±6.6 (10-31)

DCS: duplicated collecting system; HSK: horseshoe kidney; MRK: malrotated kidney; UPJ-S: ureteropelvic junction stenosis; EPK: ectopic pelvic kidney; BMI: body mass index.

Table 2: Operative and postoperative results.

	DCS	HSK	MRK	UPJ-S	EPK	Overall
Mean operation time, mins (range)	57±13 (45-70)	84±34 (30-130)	50±9 (45-60)	80±42 (35-130)	57±13 (45-70)	72±33 (30-130)
Mean hospital stay, hours (range)	26±4 (24-36)	27±10 (18-28)	22±3 (18-24)	29±11 (24-48)	20±7 (12-24)	26±8 (12-48)
Placement of internal stent	5/8	6/6	3/3	9/9	2/3	25/29
Internal stenting time (days) (range)	23±7 (15-30)	22±7 (15-30)	27±6 (20-30)	28±5 (15-30)	28±4 (25-30)	25±6 (15-30)
Stone-free rates, n						
No residual fragments	5	3	-	4	3	15 (52%)
<3 mm	3	2	3	2	-	10 (34%)
≥3 mm	-	1	-	3	-	4 (14%)
Overall	8	5	3	6	3	25 (86%)

DCS: duplicated collecting system; HSK: horseshoe kidney; MRK: malrotated kidney; UPJ-S: ureteropelvic junction stenosis; EPK: ectopic pelvic kidney.

While unilateral RIRS was performed in seven patients, bilateral RIRS was performed in one patient. The overall stone-free rate (SFR) in our series was 100%. We think that access sheath placement is the most important stage in RIRS in patients with a DCS. Since the access sheath could be advanced up to the kidney, RIRS was performed without the access sheath in 3 patients (37.5%).

Horseshoe Kidney

Management of stone disease in patients with HSK poses a clinical challenge because of the abnormal anatomy. Due to the unusual course of the upper ureter, impaired renal pelvic drainage, ureteropelvic junction obstruction, and hydronephrosis are commonly detected in these patients.[8] ESWL, PCNL, laparoscopy, and RIRS have been employed for treating patients with renal stones in HSK. Although renal stones in patients with HSK can be broken by ESWL, spontaneous passage of the fragmented stone pieces may be extremely difficult. In a study of 18 patients with stones in HSK and treated with ESWL, Kirkali et al.[9] reported that stone fragmentation to <4 mm was achieved in 78% of patients, although the SFR was only 28%. Overall, the SFR of patients with renal stones in HSK and treated with ESWL ranges from 33-78%.[9-11] Nevertheless, the retreatment rate of ESWL is up to 22.5% and the possibility of auxillary procedures is about 14.7%.[12] PCNL and laparoscopy have been successfully performed, with minor technical modifications, in the treatment of larger HSK stones.[11,12]

Since 2005, RIRS has been successfully performed in the treatment of patients with renal stones in a HSK.[6,7,11] In a study by Molimard et al.,[11] RIRS was performed without serious complications in 17 patients with HSK stones, with a mean stone burden of 16 mm and a reported SFR of 88.2%. In our study, RIRS was performed in eight renal units. Mean stone burden and overall SFR were 20.4±8.3 mm and 87.5%, respectively, which is similar to the current literature. We consider flexible ureteroscopy and laser lithotripsy as an effective treatment option in patients with HSK stones, but fragmented stone pieces should be removed, especially when dealing with lower caliceal stones.

MALROTATED KIDNEY

Although PCNL is the most effective procedure in patients with stone disease in MRK, ESWL is not as effective as the other treatment modalities due to the difficulty of spontaneous passage.[7,13] In a study enrolling 120 patients with MRK stones, ESWL conferred SFRs of 80% and 37% for stones ≤15 mm and >15 mm, respectively.[14] In contrast, success rates up to 100% were reported in patients with stone disease treated with PCNL.[13] In another small series reported by Ugurlu et al.,[7] RIRS was performed in four patients with MRK stones and

stone clearance was achieved in all patients. In the present study, RIRS was performed in three patients with MRK stones and all patients were rendered stone-free. We consider that RIRS is as effective in patients with MRK as in patients with normal kidneys.

Ureteropelvic Junction Stenosis

Although open, dismembered pyeloplasty is considered the 'gold standard' for the treatment of UPJ-S, while endopyelotomy (antegrade nephroscopic or retrograde ureteroscopic), accusize balloon, laparoscopic pyeloplasty, and robotic pyeloplasty are the other treatment options.[15] Minimal invasiveness, faster recovery, shorter hospitalisation, and direct visual control of incision are some of the advantages of retrograde ureteroscopic endopyelotomy.[15,16] Ureteroscopic endopyelotomy should be chosen in the management of patients with UPJ-S and small renal stones.[15] Therapeutic failure of retrograde pyelotomy is due to the existence of certain conditions, such as the presence of polar vessels, the length of the stenosis being >2 cm, large associated renal stone, renal function <25%, and severe hydronephrosis.[17] In the present study, while retrograde endopyelotomy and RIRS were simultaneously performed in six patients, endopyelotomy and RIRS were performed in the remaining three patients in two separate sessions. Mean stone size and mean stone burden were 11.5±4.3 mm and 16.5±5.4 mm, respectively. Although endopyelotomy was intraoperatively satisfactory, spontaneous passage was poor. Significant residual fragments remained in three patients (33.3%). The success rate of endopyelotomy was 77.7%, which was similar to that reported in the current literature.[15] We recommend that, as in HSK patients, fragmented stone pieces should be removed in patients undergoing endopyelotomy and RIRS.

Ectopic Pelvic Kidney

Ectopic position of the kidney usually presents a significant challenge to the urologist when managing patients with renal stones. ESWL is the least effective treatment option used in the management of patients with EPK stones.[7] PCNL, either alone or with laparoscopic assistance, is the most commonly performed technique for the treatment of patients with renal stones in EPK.[18] Although the SFR is acceptable after PCNL, the technique is not easy and complication rates are higher than those with normal kidneys.[18] RIRS is another option, but is associated with more technical difficulties due to ureteral kink.[5,6] There are few studies regarding RIRS in patients with renal stones in EPK.[6,7] In a study of four patients with renal stones in EPK and treated by RIRS, Weizer et al.[6] reported that the clinical success rate was 75% after only a single session. In another study by Ugurlu et al.,[7] six patients with EPK stones were treated by RIRS, the success rate of which was 66.6%. These authors also describe the difficulties of access sheath placement in these patients.[7] In our series, RIRS was performed in three patients with EPK stones. Due to the failure of access sheath placement in two of the three patients with EPK, RIRS was completed without an access sheath in two patients. Therefore, we recommend using a high-quality ureteral access sheath in the treatment of patients with EPK stones.

CONCLUSION

The combination of flexible ureteroscopy and holmium laser lithotripsy is an effective and safe treatment option in the management of urinary calculi in patients with anomalous upper urinary tracts.

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PERCUTANEOUS NEPHROLITHOTOMY FOR PAEDIATRIC STONE DISEASE

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ABSTRACT

We evaluated the outcomes and complications occurring following percutaneous nephrolithotomy (PCNL) procedures performed in paediatric patients. There were 291 paediatric patients (293 renal units) included in the current study and who underwent PCNL in our clinic between March 1999 and December 2014. We evaluated stone burden, duration of surgery and complications, success (stone-free) rate, residual fragments and auxilliary procedures, and follow-up details. The stone-free rate following PCNL was 88.3%. Early postoperative complications included excessive bleeding and transfusion in nine patients, and prolonged urinary extravasation following removal of the nephrostomy tube and requiring JJ stent placement in eight patients. The mean time to catheter removal was 2.8 days and the mean hospitalisation time was 3.5 days. The aim of kidney stone treatment is to achieve minimal kidney damage with the highest success rate. Therefore, minimally invasive procedures are important in the paediatric age group where life expectancy is high. PCNL is a safe and effective procedure for the treatment of kidney stones in children.

Keywords: Paediatric, percutaneous nephrolithotomy (PCNL), stone disease.

INTRODUCTION

The prevalence of urolithiasis has been increasing due to infection and obesity as a result of changing dietary habits and environmental and lifestyle factors.[1] Malnutrition, racial factors, and anatomical and metabolic abnormalities are the most important risk factors responsible for the high incidence and recurrence rates in children.[2] Approximately 40-50% of children with urolithiasis have a metabolic abnormality such as hypercalciuria, hyperoxaluria, hypocitraturia, cystinuria, or hyperuricosuria, with hypercalciuria and hypocitraturia being the most common.[3] The prevalence of ureteral stones in children changes with age; overall, it is approximately 2-3%.[4]

The treatment of ureteral stones changes from follow-up to open surgery. Treatment procedures include extracorporeal shock wave lithotripsy (ESWL), ureterorenoscopy, retrograde intrarenal surgery, percutaneous nephrolithotomy (PCNL), and, in some cases, laparoscopic surgery. The other type of procedure is open surgery, which is performed in cases with urinary anatomical abnormalities.[5] The treatment of ureteral stone disease in children is almost the same as with adults. Paediatric patients have a high risk of recurrence because of long life expectancy, and so minimally invasive treatment options are preferred. The use of ESWL is the first-line treatment option in children with upper ureter and renal pelvic stones <2 cm and lower pole calyx stones <1 cm according to European Association of Urology (EAU) guidelines. However, stone-free rates following ESWL decrease as the size of the stones increases. The other disadvantage of ESWL is the requirement for anaesthesia.[6] Open surgery began to lose ground when PCNL was first introduced in 1976.[7] PCNL is a minimally invasive treatment method but is not without its own risks, which include complications such as bleeding and injury to the collecting system.[8] The first paediatric PCNL was performed in 1985 and, over time,

PCNL has become the first-line treatment for kidney stones >2 cm, as described in the EAU guidelines.[6] Other conditions for which PCNL is performed include hard stones (such as cysteine and calcium oxalate monohydrate), unsuccessful ESWL procedures, and obstructed kidneys.[6,9] There are some clinical variables that affect the success rate of PCNL, including the kidney's anatomy, stone burden, and stone localisation. Stone-free rates following PCNL are reported in the literature as 73-96%.[10] Although ESWL is a well-established treatment method for paediatric and adult urinary stone disease, urinary stones resistant to ESWL and kidney stones >2 cm in size are best treated by PCNL, with minimal morbidity. In this study we report our experience with PCNL in the treatment of paediatric kidney stones.

METHODS

We retrospectively examined data from our paediatric PCNL patients. All patients who were admitted to our clinic were evaluated preoperatively using routine laboratory tests, such as blood chemistry and urine analyses and culture. To scan the urinary system, urinary ultrasound, plain abdominal films, and intravenous (IV) urography were used. If necessary, computed tomography and renal scintigraphy were performed in cases of suspected renal abnormalities, retro-renal colon, and in patients with non-opaque stones. Procedures were performed under general anaesthesia and IV cephalosporin was given preoperatively for prophylaxis. After induction of anaesthesia, cystoscopy was performed and then a ureteral catheter (4-6 Fr) was inserted into the ipsilateral ureter containing the stone. Retrograde study was not performed in order to not blur the view of the stone during fluoroscopy. Patients were then moved to the prone position, renal puncture was achieved with an 18 G percutaneous-access needle and guidewire into the most suitable kidney pole using biplanar fluoroscopy guidance. This punctured tract was dilated with an Amplatz semi-rigid dilator or balloon dilator of up to 20 or 30 Fr, depending on the patient's age and size. Finally, the renal sheath was placed. A 24 or 26 Fr rigid nephroscope was used during the procedure. Heated, sterile saline (35-36 °C) was used for irrigation of the tract and kidney. The stones were located with the guidance of a video monitor and fluoroscopy and then a pneumatic lithotripter was used to disintegrate the big stone fragments, following which they were grasped with collecting forceps; an aspiration catheter was used to aspirate the stone fragments that were too small to grasp. In the case of bleeding or the presence of residual stones, a re-entry nephrostomy tube might be placed and then radiopaque liquid given to check for perforation, residual or infundibular stone, and to correct the nephrostomy tube's position. An antegrade JJ stent was placed into the ureter if there was a need.

On the first postoperative day, the ureteral catheter was removed if urine colour was normal and a plain abdominopelvic radiograph was taken to check for residual stone fragments. Stones that were <4 mm were accepted as clinically insignificant residual fragments (CIRFs). If the stones were removed, or if there were only CIRFs present, then the procedure were considered to be successful.

RESULTS

A total of 293 PCNL procedures were performed on 291 children (mean age: 9.33 years, range: 1-16) between March 1999 and December 2014. There were 148 boys and 143 girls, with 23 having a history of renal stone disease. A PCNL procedure was performed on the right kidney in 153 patients, on the left kidney in 136 patients, and on both kidneys in two patients. Of the 291 children, 194 had middle pole stones, 46 had lower pole stones, 32 had pelvic stones, 15 had multiple kidney stones, one had a semi-staghorn stone, and three had a staghorn stone (Table 1).

The stones were completely removed in 257 of 291 patients (success rate: 88.3%), with 43 patients having CIRFs. Complications occurred in 29 of 291 procedures (10.0%). Nine of the patients with complications had bleeding and required blood transfusion, eight patients had prolonged urinary extravasation after the nephrostomy tube removal and required placement of a JJ stent, seven patients had postoperative fever, and five patients developed urinary tract infection (UTI). None of the patients needed open surgery or had major complications (Table 2). Nephrostomy tubes were kept for a mean duration of 2.8 (range: 1-4) days and the mean hospitalisation time was 3.5 (range: 2-7) days.

DISCUSSION

Open surgical procedures are being replaced by minimally invasive techniques due to technological improvements, especially in the last two decades.[11]

Table 1: The location of the stones in the kidney.

Stone location	Frequency, n (%)
Middle pole	194 (66.66)
Lower pole	46 (15.80)
Renal pelvis	32 (10.99)
Multiple placements	15 (5.15)
Partial	1 (0.34)
Staghorn	3 (1.03)

Table 2: Outcomes of PCNL.

Outcome	Frequency, n (%)
Complete stone clearance	257 (88.31)
CIRFs	43 (14.77)
Blood transfusion	9 (3.09)
JJ stent insertion	8 (2.74)
Fever	7 (2.40)
Urinary infection	5 (1.71)

CIRFs: clinically insignificant residual fragments; PCNL: percutaneous nephrolithotomy.

A similar trend is seen in the treatment of paediatric patients with kidney stones.[12] Children have a longer life expectancy than adults and so they have a higher risk of stone recurrence. Therefore, minimally invasive procedures are more frequently applied in children.[13] Currently, ESWL is accepted as first-line therapy in the management of urinary tract stones in children,[6] and provides a successful and safe modality to treat kidney stones.[14,15] However, ESWL has some limitations, such as the requirement for anaesthesia, difficulty with stones that are hard to split, and the pain experienced by patients when passing stone fragments. In contrast, PCNL is a safe and effective treatment choice for children. The success rate of the procedure in children is 66-100%, with the variability due primarily to the diverse structures of the stone(s) and the learning curve of the procedure.[11,16-18] Staghorn stones are difficult to manage during the PCNL procedure.[19] The size of dilatation is another important issue in PCNL and can be difficult, especially in children <7 years of age, when adult-sized equipment is used. Desai et al.[17] recommended that dilatation in children should not be larger than 21 Fr, especially in those <8 years of age, and also stated that larger-sized dilatations might cause more bleeding.

In our study, most patients had decreased blood haemoglobin levels following PCNL, due to haemodilution or bleeding. It is important to decide whether blood transfusion is necessary. Equipment size, operation time, and stone burden were suggested as clinical variables affecting blood loss in paediatric PCNL.[16,17] In addition, the number of punctures has been described as a cause of bleeding.[19] It is important to keep in mind that children are less tolerant to bleeding. Unsal et al.[10] preoperatively evaluated 50 patients using 99mTc dimercaptosuccinic acid and repeated this 3-6 months after PCNL. Six of the patients had new focal cortical defects occurring within the dilatation area after the procedure. Wadhwa et al.[20] reported that PCNL did not cause alterations in renal function in children. Reisiger et al.[21] showed that ESWL, ureteroscopy, and PCNL did not affect renal growth during a 6-year follow-up period. However, we still need further studies to fully understand the impact of PCNL on the kidneys of children.

Radiation hazards are the other important issue, especially in children. The International Commission on Radiological Protection state that the safe annual doses are 150 mSv for the eyes and 500 mSv for the skin and other organs. However, a single dose must not exceed 50 mSv.[22,23] Kumari et al.[24] demonstrated that patients received a 0.56 mSv dose of radiation during 6 minutes of fluoroscopy during each surgery. However, patients are also exposed to radiation during the diagnosis and follow-up procedures.[25] It was reported that patients were exposed to a mean radiation dose of 29.7 mSv during all these procedures.[23]

Radiation also has effects on the cells of the surgeon's hands, including both deterministic and stochastic effects. Deterministic effects are dose-dependent and may lead to cataract formation, haematopoietic tissue and skin failure, and infertility. The stochastic effects are not dose-dependent and could lead to genetic changes that may cause cancer formation.[26] These effects of radiation exposure are more important in children than adults.[27] The development of hypothermia is also an important complication and depends on operation time and the induction of anaesthesia.[28] Heating the room and irrigation fluids is important in order to decrease the risk

of hypothermia. Placing an electrically heated blanket under the patient is another way of protecting the patient from hypothermia. We used all three of these measures in our procedures. The other complications of PCNL, such as fever and UTI, are commonly seen. Postoperative fever and UTI rates have been previously reported as 29.3% and 5.5%, respectively.[29,30]

CONCLUSION

Although ESWL is the first-line therapy for small-sized stones, PCNL has to be the first choice for larger stones if there is no anatomical abnormality. Minimally invasive procedures are more important in paediatric patients because of the higher risk of stone recurrence and longer life expectancy compared with adults.

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