

Progression of Minimally Invasive Urological Surgery at Hôpital Général Idrissa Pouye in Dakar in 20 Years of Practice

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How to cite this paper: Jalloh, M., Loko, D.M.C., Mbodji, M.M., Ndoye, M., Diallo, A., Diallo, T.A., Diagne, S.A., Sène, M., Sakho, B., Adanmayi, H., Gassama, B., Niang, L., Labou, I. and Gueye, S. (2023) Progression of Minimally Invasive Urological Surgery at Hôpital Général Idrissa Pouye in Dakar in 20 Years of Practice. *Open Journal of Urology*, **13**, 214-222. <https://doi.org/10.4236/oju.2023.137026>

Received: June 13, 2023

Accepted: July 18, 2023

Published: July 21, 2023

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Abstract

Introduction: Open surgery is gradually being supplanted by minimally invasive surgical techniques worldwide. Our study aimed to describe the place of minimally invasive surgery at the Hôpital Général Idrissa Pouye (HOGIP) in Dakar. **Materials and Methods:** This is a descriptive cross-sectional study over a 20-years period from 1st June 2000 to 31st December 2021 in the urology department of HOGIP in Dakar. The list of all surgical procedures performed was computed. We evaluated the distribution of minimally invasive procedures (endoscopy, PCNL, laparoscopy) overall and over the years. We made calculations of proportions and statistical significance was considered for alpha = 0.05. **Results:** In 20 years, 14,855 surgical procedures were performed, of which 5344 (36%) were minimally invasive surgeries. The average age of men was 53.19 years (standard deviation: 21.77) vs 47.32 years (standard deviation: 18.43) for women. Minimally invasive procedures in the lower urinary tract accounted for 71.93% and involved 1033 cystoscopies (26.87%), 1020 Trans Urethral Resection of Prostate (TURP) (26.53%), 931 Direct Vision Internal Urethrotomy (DVIU) (24.21%), and 612 Trans Urethral Resection of the Bladder (TURB) (15.92%). In the upper urinary tract, 1461 (28.07%) minimally invasive procedures were performed, including PCNL in 193 cases (3.61%), laser endopyelotomy in 104 cases (1.95%), ureteroscopy in 486 cases (1.7%) and laparoscopy in 39 cases (0.46%). The proportion of minimally invasive surgery has gradually increased. Among the 5344 minimally invasive procedures, 333 (5.23%) were performed in 2000-2004 and 2332 (43.63%) in 2015-2019. **Conclusion:** Minimally invasive surgery represents an important part of the activity of the HOGIP urology department. Its de-

velopment has improved over the years offering its advantages to the patients.

Keywords

Open Surgery, Endoscopy, Laparoscopy, PCNL

1. Introduction

During the last century, surgery has consisted mainly of invasive procedures to manage various conditions. The wide incision of the wall constituted an induced but necessary trauma, making the post-operative period painful with longer hospital stays, ultimately imposing aesthetic consequences. In the last decade, technological innovations in digital imaging and optical engineering have allowed the improvement of video equipment, paving the way for minimally invasive surgery with the possibility for the surgeon to operate inside body cavities without incision or the need to make large skin incisions [1] [2]. Minimally invasive surgical techniques include incision-free surgery (endoscopic surgery) and surgery with minimal incisions in the centimeter range (laparoscopic surgery) allowing the insertion of miniaturized instruments, with in some cases robotic assistance. In recent years, the minimally invasive approach has become widespread in urology, driven by the multiple advantages it offers over open surgery in terms of reducing morbidity and mortality in general, including shorter operating times, the possibility of outpatient management, early rehabilitation, etc. [3] [4]. In the case of prostate and lithiasis pathologies, the minimally invasive approach provides a satisfactory response, particularly for the treatment of benign prostatic hyperplasia (BPH), irrespective of its size, and the management of stones, regardless of their location in the urinary tract [5] [6]. It is a certainty today that the advent of percutaneous nephrolithotomy, ureteroscopy, and extracorporeal lithotripsy has more than revolutionized the management of lithiasis with a decreasing frequency of open surgery [7]. Minimally invasive surgery is already implemented in other parts of the world, and the development of 3D vision combined with the increasingly capitalized expertise will only further extend its popularization in all parts of the world. In order to keep up with the advances in the discipline, the Urology-Andrology Department of Hôpital Général Idrissa Pouye in Dakar (Senegal) has acquired a technical platform for performing minimally invasive procedures. Activities were launched after training the practitioners by experts from elsewhere and a model of capacity building was set up for local and sub-regional urologists, making this center one of the pioneers in Sub Saharan Francophone Africa. After twenty years of practice, the present study aims to describe the place of minimally invasive surgery in relation to the overall activities of the department.

2. Materials and Methods

We conducted a descriptive cross-sectional study covering a 20-year period from

June 2000 to 31 December 2021, in the Urology Department of the Hôpital Général Idrissa Pouye (HOGIP) in Dakar, Senegal which represents a level III national reference university hospital.

We first listed the minimally invasive activities performed in the department and proceeded to an exhaustive sampling of all patients who underwent a minimally invasive surgical procedure during the study period among all the surgical procedures performed based on daily updated surgical operations registry based at the operating theatre.

The variables studied were sex, age, diagnosis, and surgical procedure performed. The data were collected from the operating theatre registry.

Descriptive statistics were used. Quantitative variables were calculated as mean with standard deviation. Qualitative variables were summarized by proportions. Statistical significance was accepted for p values $< \alpha$, with $\alpha = 0.05$.

3. Results

Over a period of 20 years, 14,855 surgical procedures were performed, of which 5344 (36%) were minimally invasive surgeries.

The mean age of our patients was 46.58 (SD: 23.37; range: 1 and 91 years) and a median of 48 years.

The mean age for men was 53.19 (SD: 21.77; Range: 1; 91 years) compared to 47.32 (SD: 18.43; Range: 1; 94 years). The sex ratio was 3.4. **Table 1** summarizes the average ages according to the surgical procedures.

The average age was higher for patients who underwent Trans urethral resection of the prostate (TURP), Trans Urethral Incision of the Prostate (TUIP), and

Table 1. Distribution of mean age of patients operated on in Urology at HOGIP from 2001 to 2021 according to the surgical indication.

Procedures	AGE		
	Mean	Min	Max
TURP	71.25	40	96
Cystoscopy	40.48	1	91
DVIU	54.89	13	98
JJ stent placement	44.44	6	94
TURB	59.35	5	94
URS	41.36	6	74
PCNL	43.62	6	80
Laser endopyelotomy	39.27	15	79
JJ stent removal	30.67	1	79
TUIP	65.18	61	96

TURP: Trans Urethral Resection of the Prostate; DVIU: Direct Vision Internal Urethrotomy; TURB: Trans Urethral Resection of the Bladder; URS: Ureterorenoscopy; TUIP: Trans Urethral Incision of the Prostate.

Trans urethral resection of the bladder (TURB) with 71.25, 65.18, and 59.35 years respectively.

Minimally invasive procedures of the lower urinary tract were performed in 3844 cases (71.93%) and mainly concerned cystoscopy for 1033 cases (26.87%), TURP for 1020 cases (26.53%); DVIU for 931 cases (24.21%); and TURB for 612 cases (15.92%). JJ stent removal, Trans Urethral Incision of the Prostate, and cystolithotripsy were poorly represented with 94 cases (2.44%), 86 cases (2.23%), and 68 cases (1.8%) respectively.

Women accounted for 146 (15.12%) and 169 (27.61%) of all cystoscopy and TURB procedures respectively, compared to 819 (84.88%) and 43 (72.39%) for men.

Considering the upper urinary tract, 1461 (28.07%) minimally invasive procedures were performed (**Table 2**). These were JJ stents in 678 cases (12.69%) for 205 women and 473 men, percutaneous nephrolithotomy (PCNL) in 193 cases (3.61%) for 98 women and 95 men, laser endopyelotomy in 104 cases (1.95%) for 53 women and 51 men, ureteroscopy in 486 cases (1.7%) for 78 women and 408 men.

Laparoscopy was conducted in 39 cases (0.46%), with 13 pyeloplasties, 12 nephrectomies, 11 varicocele repair, and 05 cystectomies.

The distribution of all minimally invasive procedures by year is shown in **Table 3**. The proportion of minimally invasive surgery has gradually increased. Indeed, among 5344 minimally invasive procedures, 333 (5.23%) were performed in the period 2000-2004 and 2332 (43.63%) in the period 2015-2019. Overall, minimally invasive surgery accounted for 36% of the procedures.

Over the years, minimally invasive procedures have steadily increased, gradually closing the gap with open surgery as shown in **Table 4**. In the beginning of the 20' the surgical procedures were mostly open surgery, for example in the period 2000-2004, open surgery accounted for 1842 cases versus 387 for minimally invasive surgery. The gap was progressively closed and in the period 2015-2019 open surgery accounted for 2616 cases versus 2221 cases of minimally invasive surgery.

Table 2. Distribution of minimally invasive procedures of the upper urinary tract in Urology at HOGIP from 2000 to 2021.

Endoscopy of the Upper urinary tract	MEN		WOMEN	
	n	%	n	%
JJ placement	473	32.37	205	14.03
URS LASER	408	27.92	78	5.33
PCNL	95	6.50	98	6.70
Endopyelotomy	51	3.49	53	3.66
Total	1027	70.28		29.72

Table 3. Distribution of minimally invasive procedures in Urology at HOGIP from 2000 to 2021.

PROCEDURES	YEARS					Total
	2000-2004	2005-2009	2010-2014	2015-2019	2020-2021	
TURP	24	112	314	466	104	1020
Cystoscopy	257	195	257	256	68	1033
DVIU	36	164	313	368	50	931
JJ placement	00	42	138	372	126	678
TURB	00	71	206	278	57	612
URS	00	00	87	291	108	486
PCNL	00	00	18	112	63	193
Laser endopyelotomy			25	48	31	104
JJ removal		7	20	52	15	94
TUIP	7	18	16	37	8	86
Laparoscopy			8	19	12	39
Others	09	08	12	33	6	68
TOTAL	333	617	1414	2332	648	5344

Table 4. Distribution of minimally invasive procedures and open surgery in the department of Urology at HOGIP from 2000 to 2021.

Period	Number of Open Surgery	Number of Minimally Invasive Surgery
2000-2004	1842	387
2005-2009	2402	717
2010-2014	2076	1537
2015-2019	2616	2221
2020-2021	535	482

4. Discussion

We have described the evolution of minimally invasive surgery over 20 years in a Level III University Hospital Service. Our study shows a regular and clear progression of minimally invasive surgery with an overall percentage of 36% of all surgical procedures. The limitations of our study are related to not taking into account outpatient cystoscopies under local anesthesia and the lack of data on surgical complications and postoperative results. Nevertheless, this study shows the interest in minimally invasive surgery and the need for support in the training of practitioners, the supply of equipment for minimally invasive urology and the maintenance of such equipment. Ultimately, all this efforts will improve both patients and surgeons comfort.

Minimally invasive surgery is a technological innovation that has become an

essential part of modern urological practice. It is comfortable for both urologists and patients with a reduced hospital stay and morbidity [8]. It has been widely used for several decades in developed countries. It began to develop in sub-Saharan Africa at the beginning of the 21st century. Senegal is one of the first countries in this dynamic. Indeed, endourology started at the Hôpital Général Idrissa Pouye in Dakar in 2002. During this same period, other countries in the sub-region have made this progress. This is the case of Côte d'Ivoire in 1999 [9] and Niger in 2022 [10]. Other countries such as Mali [11] and Chad [12] followed this trend in 2008 and 2014 respectively. Thus the era of modern urology in Sub Saharan Africa has opened up, allowing the urologists to expand his field of action.

As early as the 1960s and 1970s, Algeria, Tunisia, and Morocco introduced endoscopy into their diagnostic and therapeutic methods [13], therefore long before the countries of Sub-Saharan Africa. This delay in low-income countries is due on the one hand, to the lack of means to acquire the necessary equipment and, on the other hand, to the lack of qualified personnel [14].

Over a period of 20 years of activity, we counted 5344 minimally invasive diagnostic and therapeutic procedures, which constituted 36% of the 14,855 surgical procedures performed during the same period in the department. This represents an important part of the activity of our department. This proportion is higher than those of Eziyi *et al.* in 2008 [15] and Takure in 2012 [16] who reported 25% and 28% of minimally invasive surgery respectively in their studies. This difference is due, among other things, to the longer endoscopic implantation time in our study. Furthermore, minimally invasive surgery requires the acquisition of equipment in the first instance with a good maintenance system, but also well-trained personnel. The learning curve for endoscopy is variable and requires a long time and exposure. As far as Senegal is concerned, it has been shown that the training of practitioners, especially in their own departments and environment, is a factor of progress in the adoption of minimally invasive urological surgery [17] [18]. This training goes together with a concern for evaluating results in the early stages of practice, particularly with upper urinary tract endoscopy which is still in the learning curve phase [19].

In France, DOZI *et al.* [7] reported 23,162 minimally invasive procedures performed for the treatment of urinary lithiasis over a period of 30 years, a volume of activity larger than ours. The expertise available in developed countries leaves little room for open surgery, which is mainly reserved for reconstructive surgery and trauma settings. The main concern for patients undergoing surgery is pain from surgical wound and delay in resuming activities. This situation has led many surgeons to re-evaluate their approach and opt for minimally invasive surgery [10].

Thus, on the urinary tract, several surgical techniques have been described, we have performed PCNL, ureteroscopy, endopyelotomy, pyeloplasty, nephrectomy, and laparoscopic cystectomy. For most of these indications, open surgery

now has a limited place. It is clear that developing countries are still struggling to be in accordance with these recommendations [5] [6]. In our case, certain procedures are already well established, such as PCNL with 193 cases, ureterorenoscopy with 486 cases, and endopyelothomy with 104 cases. These achievements exceed the number expected to have expertise in each of these procedures. In Sub-Saharan African regions [11] [12], the reported achievements are lower than in our study partly because these procedures are in the early phase of acquisition in most countries compared to our relatively long experience. Other procedures are being acquired in our department, such as laparoscopy with 39 cases.

In the lower urinary tract, the techniques performed were TURP (1020 cases), TURB (612 cases), DVIU (931 cases), TUIP (86 cases), and JJ stent removal (94 cases). Mahamat Ali *et al.* [12] report 41 cases of TURP, 11 cases of TURB, 45 cases of DVIU, 57 cases of cystoscopy, and one case of TUIP. In our study period, several lower urinary tract conditions were explored and treated by endoscopic surgery, the most frequent of which being prostate tumors. The African population is increasingly aging, which could explain the high incidence of prostatic diseases.

Urethrocystoscopy was performed in 965 cases and is an essential step in the diagnostic and therapeutic approach in urological practice [20]. In modern urology, endoscopy is a necessity, as it allows diagnosis and treatment of urological conditions with more comfort and fewer complications.

Minimally invasive surgical approach has gradually increased in HOGIP. Its advantages are widely recognized even though it poses many challenges regarding equipment availability and maintenance [7].

5. Conclusion

Minimally invasive surgery is clearly progressing in the Urology Department of Hôpital Général Idrissa Pouye. It has revolutionized the management of urological pathologies. This technique must be promoted and encouraged to improve the quality of patient care as well as the comfort of practitioners and patients.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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