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Original Article

Pulmonary Complications and Peri-Operative Outcomes of Open Renal Surgery in HSAJB During COVID-19 Pandemic

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ABSTRACT

Perioperative Covid-19 infection is associated with high risk of pulmonary complications and death. This study aimed to describe the pulmonary complications and peri-operative outcomes of open renal surgery done and to identify the possible associated factors for development of postoperative pulmonary complications. This is a clinical audit of all non COVID-19 patients underwent open renal surgery in Hospital Sultanah Aminah, Johor Bahru from January 2020 to January 2022. Socio-demographic data and factors associated with development of pulmonary complication were collected. Intraoperative outcome and post-operative pulmonary complications and outcomes were described. Bivariate analysis was performed to determine the association of the factors with the development of pulmonary complications. A total of 30 patients were included. 22 open radical nephrectomies, 7 open radical nephro-ureterectomies with bladder cuff excision and 1 open pyeloplasty were done. The mean operation time was 200±58.5 min (100-335 min) and blood loss was 1578±1930ml (200-8000 ml). The pulmonary complication rate was 10%. The mean hospital stay was 13±8.8days (6-45days). Thirty days mortality rate was 3.3%. ASA grades were found to be significant association with the development of pulmonary complications. Open renal surgery is safe to be done in Covid-19 treating hospital during COVID-19 pandemic.

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INTRODUCTION

Coronavirus disease 19 (COVID-19) infections are increasing in Malaysia. There are 30,246 new infections reported on average each day in March 2022. There have been 3,711,199 infections cumulative and 33,496 COVID-19 deaths reported in Malaysia since the pandemic started (1). Due to the risk of in-hospital transmission during the early phase of pandemic, about 2.3 million cancer operations worldwide were delayed (2). This is because perioperative Covid-19 infection is associated with high risk of pulmonary complications and death (3-4).

Since the surging of COVID-19 cases in Malaysia, in order to increase intensive care capacity for patients with COVID-19 and to mobilize more doctors to support wider hospital responses in government hospital Malaysia, elective surgery was reduced. However, patients with resectable cancer, whom alternative treatment modalities would be ineffective, will still be prioritized to undergo elective surgery.

Perioperative Covid-19 infections and pulmonary complications

Studies have showed that perioperative Covid-19 infection rate ranging from 7.7% - 23%. 30-day mortality was 23·8%. Pulmonary complications occurred in 51·2%. (5,6). Pulmonary complications, defined as pneumonia, acute respiratory distress syndrome, or unexpected postoperative ventilation.(5) Studies have showed that patient's pulmonary complication rates were lower with COVID-19–free surgical pathways (2.2% vs 4.9%). Lower pulmonary complication rates was significantly associated with ASA (American Society of Anesthesiologists grade 1/2), and patients with negative COVID-19 preoperative tests. The postoperative COVID-19 infection rate was also lower in COVID-19–free surgical pathways (7). However local data regarding above mentioned data for open renal surgery in Covid-19 treating hospitals still remain scarce.

30-day mortality was associated with male sex, age 70 years or older American Society of Anesthesiologists (ASA) grades 3–5, emergency surgery, and major surgery according to an international cohort study (5).

Perioperative outcomes of open renal surgery

For perioperative outcomes, studies show that open radical nephrectomy has shorter operative time compared to laparoscopic approach (165.3 minutes vs 180.8 minutes), and there is no difference in 5-year survival data. (8). However, studies also shows that open approach has significant more blood loss (160.8ml vs 110.6ml), more narcotic was required postoperatively, longer the fasting period (2.9 days vs 1.3 days) and hospital stays (8.9 days vs 4.6 days).

The potential value of our study might provide patient-level outcomes local data for urology patients who had open renal surgery and acquired perioperative Covid-19 infection. This might aid in developing local guideline for urology surgery during this pandemic.

OBJECTIVES OF THE STUDY

This study aimed to describe the rate of pulmonary complications (unexpected ventilation, acute respiratory distress syndrome and pneumonia), the peri-operative outcomes for open renal surgery patients (operative time, blood loss, length of hospital stay and incidence of inpatient acquired COVID-19 infections and 30-day mortality rate) and the associations of potential risk factors (BMI, ASA, respiratory comorbidity, smoking, pre-operative COVID-19 screening (RTK/PCR)) with the development of pulmonary complications.

MATERIALS AND METHODS

Study design

This is a clinical audit included all patients posted for open renal surgery (open radical nephrectomy, open radical nephroureterectomy with bladder cuff excision, open pyeloplasty) from January 2020 to January 2022.

Data collection

The operative theatre census, patient medical records, blood investigations, operative notes and clinic follow up cards were reviewed retrospectively to collect all the data. Timing for data collection started from January 2020 because on 25th January 2020, the first case of COVID-19 was detected in Malaysia. (9) A total number of 30 patients were included based on the urology operative census. Surgeries were done using standard Personal Protective Equipment (PPE), including face shield or goggles, 3-ply surgical face masks, gloves, and gown. The following parameters were collected, socio demographic information (age, sex and ethnicity), factors associated with development of pulmonary complications (BMI, ASA, respiratory comorbidity, smoking, pre-operative COVID-19 screening (RTK/PCR)), intraoperative outcome (operative time and blood loss) and post-operative outcomes (pulmonary complications (pneumonia, acute respiratory distress syndrome, unexpected ventilation), length of hospital stay, and incidence of inpatient acquired COVID-19 infections.

Patient selection eligibility

Inclusion Criteria

1. All patient underwent open renal surgery (Open Radical Nephrectomy, Open Simple Nephrectomy, Open Radical Nephroureterectomy and bladder cuff excision, Open Pyeloplasty)

Exclusion Criteria

1. COVID-19 positive patients

Statistical analysis

The data were recorded and processed using Microsoft Excel. The data analysis was done using the SPSS version 22. Descriptive date was expressed as mean ± standard deviation (SD) for normally distributed data and median (Interquartile range) for non-parametric data. The data collected was analysed using an intention-to-treat basis. In order to verify the potential risk factors with pulmonary complications, bivariate analysis was done and level of significance was set at 0.05.

Ethical committee approval

This study was registered with National Medical Research Registry (NMRR) [NMRR ID-21-01981-SP1 (IIR)]. Ethical approval was obtained from Medical Research and Ethics Committee (MREC), Ministry of Health, Malaysia on 14 Dec 2021 (Reference No: 21-01981-SP1)

Privacy and confidentiality

Subject's names were kept on a password-protected database and were linked only with a study identification number for this research. The identification number instead of patient identifiers was used on subject data sheets. All data was entered into a computer that was password protected. On completion of study, data in the computer were copied to CDs and the data in the computer were erased. CDs and any hardcopy data was stored in a locked office of the investigators and maintained for a minimum of three years after the completion of the study. The CDs and data will be destroyed after that period of storage. Subjects were not allowed to view their personal study data, as the data would be consolidated into a database.

RESULTS

1. Socio-demographic characteristics of study samples and types of open renal surgery

Table 1 illustrated the socio-demographic characteristics of the study samples, types and indications of surgery. Of the 30 patients underwent surgery during this pandemic, the majority of patients are male (73.3%) and Chinese (50.0%) race. The mean age is 50.1 years with the range from 11 to 75 years old. Furthermore, 73.3% of surgery is open nephrectomy. 83.3 % of our study samples are indicated for surgery because of tumors. Other indications include trauma, non-functioning kidneys and pelvic-ureteric obstruction (PUJO).

2. Pulmonary complications and perioperative outcomes

Table 2 illustrates the peri-operative outcomes of the study samples.

Of all the 30 cases done, pulmonary complications developed in 10% of them. All of them were diagnosed to have hospital acquired pneumonia and did not

required assisted ventilation. They were tested for Covid-19 PCR post operatively and found to be negative.

The mean operation time was 200±58.5 min (100-335 min) and mean blood loss was 1578±1930ml (200-8000 ml). The mean hospital stay was 13±8.8days (6-45days). 30 days mortality rate was 3.3%.

3. Analysis of the relationship of potential risk factors with the development of pulmonary complications.

Table 3 shows the association of the risk factors with the development of pulmonary complications.

Of the 30 patients, their mean BMI was 25.2±3.6, 46.7% belonged to ASA 1 and 2, 86.7% did not have respiratory comorbidity, 50% were smoker and 53.3% underwent RTK-Ag swab preoperatively.

Bivariate analysis was done to analyse the possible risks factors with the development of pulmonary complications. American Society of Anesthesiologists (ASA) grades had significant association with the development of pulmonary complications. However, other variables like BMI, respiratory comorbidity, smoking and pre-operative Covid swab did not show any significant association with the development of pulmonary complications.

DISCUSSION

Covid-19 pandemic has caused a global impact to our healthcare system including operative surgery. This is the first clinical audit of perioperative outcomes of major urological surgery in government Covid-19 treating hospital in Malaysia.

Before pandemic, Hospital Sultanah Aminah (HSA), Johor Bahru is the tertiary referral hospital for whole southern region Malaysia, and most of complicated urology cancer surgery was done in this hospital. During the pandemic, HSA has admitted patients with COVID-19, hence increasing risk of cross infection of elective patients. Dedicated COVID-19–free surgical pathways should be established to provide safe elective cancer surgery during this pandemic as suggested by an International, Multicenter, Comparative Cohort Study (7). However, complete segregation of the operating theater, critical care, and inpatient ward areas with COVID-19 patients is challenging due to limited resources in hospital. Outbreaks of COVID-19 infections at inpatient ward and among healthcare worker are often reported. With the limited resources in government hospital, my study results show that 30 day mortality rate is 3.3% which is lower compared to the rate of 18.9% reported in literature (7). The cause of death of the subject in my study was not related to COVID-19 infections.

In Department of Urology HSA, JB, open approach is the preferred modality for most of our major renal surgery since the pandemic began. This is because safety

of laparoscopic surgery is debated out of fear for COVID-19 transmission, arising from the potential generation COVID -19 contaminated aerosols from CO2 leakage and the creation of smoke from the use of energy devices (10). Open surgery is also less time consuming and recommended by several studies (11). The mean blood loss of 1.5litre in this study was higher compared to that of available literature because of an outlier of one single case which had a blood loss of 8litre and activated massive blood transfusion protocol. The mean operative time, duration of hospital stays were fairly comparable to that reported in literature.

This study showed that ASA grades were significant associated with the development of pulmonary complications. Similar findings as also reported in several other studies (5, 13). ASA 3 patients were shown to be more susceptible to pulmonary complications thus increased post-operative mortality and ICU admission (13). Type of pre-operative swab was not significantly associated with pulmonary complications. However, it needs to be done according to MOH pre admission guidelines to ensure the safety of health care workers and in ward patients (14).

LIMITATIONS

The cases were done in one single tertiary urology centre. Types of urology surgeries done in other hospital might be differ from our centre. Besides, only those symptomatic were tested post-operatively to exclude COVID-19 infections leads to selection bias. There are problems of bias and inaccurate data because this is a retrospective study. The study sample size is small so it may not be suitably powered to look for associated factors.

CONCLUSION

Post-operative pulmonary complications and mortality rate is low among patients underwent open renal surgery in Covid-19 treating hospital. This shows that urology surgery is safe to be done in government tertiary centre during Covid-19 pandemic with negligible risk of perioperative Covid-19 infections.

CONFLICT OF INTEREST

The investigators declare they have no conflict of interest

ACKNOWLEDGMENT

This is a self-funded investigator initiated research.

Table 1: Study Samples Socio Demographic Characteristics

Variables	**Total N(%)**
Age (Years)	
Mean (SD)	50.1 (17.9)
Range	11 - 75
Gender	
Male	22 (73.3)
Female	8 (26.7)
Ethnicity	
Malay	13 (43.3)
Chinese	15 (50.0)
Indian	2 (6.7)
Types of Surgery	
Open Nephrectomy	22 (73.3)
Open Nephroureterectomy + bladder cuff excision	7 (23.3)
Open Pyeloplasty	1 (3.3)
Indications	
Tumors	25 (83.3)
Non Tumors	
Trauma	1 (3.3)
Non Functioning Kidney	3 (10.0)
PUJO	1 (3.3)

Table 2: Peri-operative Outcomes

Peri- Operative Outcomes	**Total N(%)**
Blood Loss (ml)	
Range	200-8000
Mean (SD)	1578 (1930.0)
Operation Time (Mins)	
Range	100-335
Mean (SD)	200 (58.5)
Pulmonary Complications	3 (10)
Hospital Stays, Days	
Range	6-45
Mean (SD)	13 (8.8)
30 Days Mortality Rate	1 (3.3)
Covid Infectons Post Op	0 (0)

Table 3: The relationship of risk factors with pulmonary complications

	Total N(%)	Pulmonary Complications Yes, N(%)	No, N(%)	P-Value
BMI				
Mean (SD)	25.2 (3.6)	26.3 (2.1)	25.3 (4.1)	0.677[a]
ASA				
1	14 (46.7)	0 (0)	14 (100)	0.007[b]
2	14 (46.7)	1 (7.1)	13 (92.9)	
3	2 (6.7)	2 (100)	0 (0)	
Respiratory Comorbidity				
Yes	4 (13.3)	0 (0)	4 (100)	1[b]
No	26 (86.7)	3 (12.5)	21 (87.5)	
Smoking				
Yes	15 (50.0)	3 (20)	12 (80)	0.224[b]
No	15 (50.0)	0 (0)	15 (100)	
Pre-Operative Covid Swab				
PCR	14 (46.7)	2 (14.3)	12 (85.7)	0.586[b]
RTK-Ag	16 (53.3)	1 (6.3)	15 (93.8)	

a: Independent T test
b: Fisher Exact test

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