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ORIGINAL RESEARCH PAPER

Surgery in COVID-19 times: a multicenter study for generating guidelines for open and laparoscopic procedures in both urban and rural North East Indian setting

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ABSTRACT

Introduction*: Performing surgery during the COVID-19 Pandemic has caused a serious headache for the surgeons and surgical team members. Already many surgeons, as well as the team members, are exposed to the virus leading to fear and panic among the surgical fraternity. Many Surgeons succumbed to this dreaded viral disease. Many elective and semi-emergency cases are being deferred causing hardship to the patients. In such a scenario generating a universal acceptable standard operative procedures (SOP) for both the rural and urban areas is a necessity. We studied the subject in varied backgrounds and generated a guideline so that surgery can continue safely in both these backgrounds in North-East India.* ***Materials and methods****: We studied the cases from 01.04.2020 to 16.06.2020 done in both the rural and urban setting and found that there already exist different SOPs in various settings. We collected the guidelines and approach to these hospitals and formulated one guideline, which can be universally applied to hospitals across the region in both the rural and urban settings.* ***Results:*** *We have submitted the results of various hospitals settings and found that the results are encouraging. None of the hospitals reported the spread of COVID-19 during the study period. This encouraged us to generate a numerical checklist for any hospitals doing surgeries during this pandemic.* ***Discussion:*** *We have discussed in details about the various SOPs in place and found that many of those steps are common amongst the participating hospitals. This led us to believe that it will be useful to generate a common SOP applicable to both the rural and urban background in this region.* ***Conclusion****: The SOP thus generated should be able to help in performing surgeries without fear and risk of spread of the disease.*

Keywords*: COVID 19; Surgery; SOP; OT Safety.*

INTRODUCTION

COVID 19 has become a seriously viral Pandemic. Many interesting facts are coming to the front daily. Initially thought to be spread by droplets, it is now confirmed to be spread by aerosol. The aerosol-generating procedures (AGP) are defined now.[1] The WHO is visibly confused and it is showing in its flip-flops on the disease. The behaviour of the disease is different from the presently known behaviours of the CORONA spectrum.[2] The autopsy findings are very alarming.[3] The lungs get badly damaged in this disease. The intravascular coagulation is also baffling. Already transplantation was needed for the illness on a young adult in the USA.[4] Several healthcare givers have become infected and many have lost their lives. The operation theatre

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environment is the most dangerous. The basic safety protocols are not possible to maintain in the OT physical distancing, safety from droplets and aerosol are not easily done in the OT. In such a scenario and absence of a consensus on its treatment[5,6] it s thought that laparoscopic surgery is probably more dangerous to cause the spread by generating more aerosol inside the OT.[7, 8] In such a situation we have looked into the available literature and are accumulating some tips and tricks to avoid the risk of spreading the disease from the OT environment.

MATERIALS AND METHODS

A total number of 699 cases collectively in all the three institutes and the sister centres in most of the corners of Assam were operated upon during the period from 01.04.2020 to 16.06.2020. The HAMM group with its four sister centres situated in the rural Assam led from the front with highest numbers (368) of operations in these four study institutions. Team Apollo from the city of Guwahati, the gateway to North-East India did well too with 95 cases. Jorhat Medical College did well with full academic standard and follow up of various guidelines issued by the ICMR, MOH and the Government of Assam. It behaved like a responsible teaching Institute, teaching its students the standard, protocols and developed their SOP and above all not be afraid of the disease. It performed 70 procedures during the period including several laparoscopic procedures. Nazareth from Meghalaya, Shillong did 166 operations with over 38 laparoscopic procedures.

Team Dr AK Deb from Apollo Hospital, Guwahati shared their experience. A detailed analysis of the centre is available with representation graphs and statistical diagrams. A total of 95 cases were operated from the 1st of April 2020 to 16.06.2020. 75 patients underwent laparoscopic procedures and the rest open procedures under general anaesthesia (**Figure 1**).

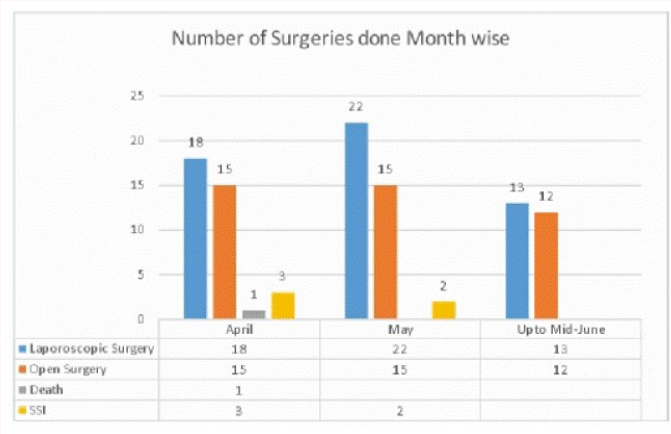

Figure 1 Number of surgeries in Apollo Guwahati in the study period

Inclusion criteria: The patients were taken after confirming symptomatic negative as per the WHO criteria. The operation team did not have access to rRT PCR COVID-19. Preventive measures were applied. It included PPE, N95 masks and Face shields for all operating procedures for all the People inside the OT for laparoscopic procedures, the Trocar and cannula were checked for leaks and worn our washers as well as tired cannulas. Defective types of equipment were discarded. Savlon water seal drainage (Innovation by the team) was made universal for all laparoscopic procedures for the release of gas (**Figure 2)**.

Figure 2 Exhausting CO2 through viricidal solution

Follow-ups of over 14 days did not show any COVID 19 spread on any OT Workers and patients.

It can be safely taken as a model of safety as the procedures were undertaken at a time when no testing facilities were available and the pandemic was showing its ugly head strongly and defiantly.

Team of Dr Jayanta Das from the Nazareth Hospital in Shillong in the same period performed a total number of 166 Major operations. Their Laparoscopic rate was 40%. It included some complex procedures, taking over two hours of O.T time. Dr Das and his team maintained an SOP in their OT. Nazareth Hospital did not have the facility to check the rRT PCR COVID 19 in all patients preoperatively. Patients were restricted to need basis and selective approach was followed. The patient screening was done by detailed history. Anyone having contact history with a COVID 19 patient was operated in a dedicated COVID 19 specific operation theatre. Full body PPE kit was used and stricter precaution for stopping the spread of the infection for these operations.

However, when normal operation theatre was used, they maintained a definite SOP too as routine Chest skiagraphy of the patients for operation on a preoperative day. Least possible number of peoples was allowed inside the operation areas. Patients were taken in with a three-layered mask on. Regional anaesthesia like Thoracic epidural, spinal and regional blocks preferred wherever feasible. When intubation is needed the Endotracheal tube is clamped till connected. The anesthetist uses N95 masks, Face shields, Disposable gown and Mcintosh. OT Floor repeatedly mopped with Viricidal solution.

surgeons wear N 95 masks, goggles, plastic disposable aprons and below knee length non-disposable boots. The surgeon enters once the patient is anaesthetized and ready for the incision. During the procedure, diathermy is used minimally and the smoke is simultaneously sucked. It goes to the suction container which contains Viricidal solution. During laparoscopic surgery, the set up uses a side channel to evacuate the smoke into a Viricidal solution as in water seal drainage system. Suction goes to the Viricidal containing bottle. Pneumoperitoneum is reduced totally under vision at the end of the procedures.

Dr Chaidul Islam and his team in their various hospitals undertook 368 major operative procedures. Their average procedures were divided between lap and open procedures as 75% and 25% respectively. The team went by meticulous history to find out the history of fever, cough, sore throat, diarrhea in the last three weeks. As a precautionary measure, if any of those found in the history, the patients were advised to wait for three weeks and taken up for surgery after the wait is over and the patient is cleared of those complaints. They did not do any modification in their OT. The team initially started with full PPE kits during procedures. After 40 consecutive cases, they scaled down the PPE to N95 masks, face shields, Mcintosh and shoe covers.

A follow up of over 14 days showed no COVID 19 on any of the treating team or the patients so far. However, a word of caution here, it is better to comply with the barriers till such time the tests are available.

The Jorhat Medical College performed 70 operations during the time. Initially, laparoscopic procedures were not undertaken for there was the report of higher aerosol generation due to Carbon Dioxide insufflations, leakage and deflation. The laparoscopic procedures started once reports from some reliable world bodies suggested that there were no additional risks involved. The precaution was taken, discussed and followed in the department systematically as the institute is a post-graduate teaching institute and the trainees are guided accordingly. Jorhat Medical College erected a model. As we had a Viral Laboratory, we had the privilege to get the rRT PCR COVID-19 testing done preoperatively. We had an SOP in place from very early on.

1. Desperate emergencies like shattered spleen; we went in after sending rRT PCR. Did not wait for the report. Open surgery with the full team, constituted with the least number of persons inside the operation area, under the available complete hooded PPE and face shields (**Figure 3**).

2. In certain cases where a preoperative time is possible, like a perforated hollow viscus or acute appendicitis or a strangulated hernia, we waited for PCR report and if negative, we could go in with N95, face shields, goggles, Mcintosh. If positive with full PPE. But we did not have any positive patients to operate upon.

3. Elective cases. We started slowly. Being a Government facility with COVID hosting, we had to reserve our manpower. Once we started, we followed the SOP for it again.

Figure 3 With Full PPE protection in indeterminate and COVID 19 Cases

The SOP prepared as Patients were screened in the triage area. A good history to exclude contact to COVID 19. Patients with Fever cough and travel history were sent to Pulmonologist for screening.

Fresh Investigations were done (Chest X-RAY). PAC by the team anaesthesia, if cleared then. The patients were asked to be admitted on the day of giving swab for rRT PCR

No contact with outsiders without screening. Only Negative patients were taken up for surgery. The reports of severe postoperative complications if procedures done in COVID 19 illness made us avoid those. Open cases are performed as per the guidelines initially. We had some small modifications in the environment of the OT An exhaust fan would always be on as negative pressure OT was not easy to erect. The outgoing air is supposed to pass through a continuous film of 1% sodium hypochlorite solution. Full PPE were made available for all and anyone could use it at will**.** N95 Masks for all entering the complex. As in the case of Apollo, Guwahati, all Washers of the laparoscopic cannulas were changed to the tight-fitting one. The gas outline was passed

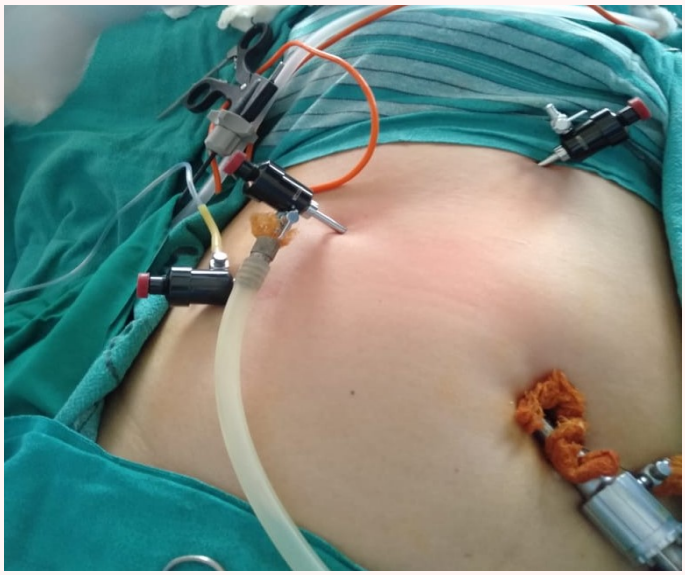

Figure 4 Povidone iodine-soaked gauge in all leak areas

through a bottle of 70% alcohol (Water seal drainage). One set was good for three cases at least. We changed only the drip set line (**Figure 4**).

The suction bottles (if central suction was not working) had 1% Sodium Hypochlorite solution to prevent viral aerosol. All the vents had PVP-I coated moistened gauge cover to stop the viral spread to the team.

Team anaesthesia used a specially designed shield box (**Figure 5**) for the introduction of the endotracheal tube. At times video endoscopy was used. 3 Micron HEPA filters were used to protect the anaesthesia stations.

Figure 5 Shield for the Intubation

On follow up of 14 days: No surgical team members or anesthesia team members or any patients were infected from the OT.

RESULTS

It is said that the virus will stay. Like HIV, we need to take care to prevent its spread. The spread can be blocked if small steps are taken in the operating environment.

A stepwise generated SOP from the above materials and methods in various settings to avoid the spread of COVID 19 now in both rural as well as the urban areas can now be enumerated. Soon testing facilities, which are reliable and fast, will be available widely. It would be wise to test the patients for the presence of COVID-19 preoperatively. Till such times-

1. Contact history of the attendants must be taken.
2. The patient stays in the ward after giving a sample for the tests.
3. A chest skiagram the day before the day of surgery is a cheap, quick and reliable objective evidence against the COVID-19 presence on the patient.
4. Routine pre-anesthesia-checkup (PAC) procedure will do.
5. All patients must be taken to OT with a triple-layered mask on.
6. Minimum utilization of manpower is expected. However, in teaching institutes, the learners must be made to follow the safety procedures strictly.
7. OT environment need not be negative pressure. Continuous airflow has shown to reduce the viral load on an ambulance carrying open COVID-19 patients. So, an exhaust fan which will throw out the air through a film of 1% sodium hypochlorite solution is safe and non polluting to the environment outside the OT.
8. The central suction unit will release the air through a viricidal solution into the environment.
9. The inside suction apparatus will have 1% sodium hypochlorite solution too.
10. Surgeons, anesthesiologists, assisting sisters and circulating nurses along with the multipurpose workers must use appropriate PPE like N-95 mask, plastic aprons, disposable boots, caps, face shields or goggles.
11. 3 Micron High Efficiency Particulate Air (HEPA) filters in the inlet and the outlet of the anaesthesia tables are a must.
12. All laparoscopic trocar and cannulas must be tight-fitting and without air leak.
13. A side vent must be used to release carbon dioxide through a water seal drainage kind of system through a viricidal solution. The bottle can be used multiple times; the tube needs change in each case.
14. All cannula mouths must have a protective wrap-around with 10% povidone-iodine soaked gauge which should be moistened in the interval.
15. The end, the release of gas must be done under vision.
16. The main surgeon is responsible to check the gas bubbling out through the system.

Below is the model of guidance that can be suggested in the rural surgical set ups.

Till such times the testing facilities and vaccines are available, meticulous history to find out the history of fever, cough, sore throat, diarrhea and loss of smell in the last three weeks are of importance.

If any of those found in history, the patients are advised to wait for two weeks and taken up for surgery after the wait is over and the patient is cleared of those complaints.

In such a backdrop, no modification in OT is necessary. N95 masks, face shields, plastic apron and shoe covers are found to be enough as barriers.

DISCUSSION

On analyzing the experiences of the various hospitals in

different setups and different states it was easy to find that all the surgeons were concerned with patient safety too. The institutes may not have a documented SOP s in place but had a strong disciplined practice in place. The number of surgeries was not negligible. Considering all the procedures were need to have a basis, it was indeed a great effort. All procedures were undertaken when the death rates in the western world were scary and in India too it was spreading like wildfire.

We find three distinct models here. One the rural set up under the leadership of Dr Chaidul Islam of HAMM group of Hojai, a small rural town in central Assam. It had four more sisters concern in the western Assam in the rural Town-ships. Their principle fits with the presently available data, which suggest that COVID-19 is more active in the cities. Their model can safely be applied to any rural setting with individual SOPs in place.

We have another semi-rural but academic institute background here. The Jorhat Medical College, department of surgery is a postgraduate training department, set up in a semi-rural background. Jorhat being an important town in the upper Assam is in a rural ambience. From the day the pandemic was declared, the department, sat down and prepared an SOP of surgery and distributed it to all. Being a postgraduate teaching institute is needed to adhere to the teaching standards ad it did so. So, whenever the procedures started, we never had any confusion about what to do.

We have here another model from the capital city of Meghalaya, Shillong. One of the busiest tourist spots in the world. The Nazareth hospital is one of the oldest healthcare institutes in the North East of India and a missionary one. They had an SOP in place and it was found to be having components common to the institutes working in urban areas.

Finally, the Apollo Hospital in Guwahati. Dr AK Dev and his team had an SOP in place and did several surgeries guided by their protocol successfully. No team reported any COVID-19 spread to any HCWs or patients within 14 days of post-op follow-ups.

CONCLUSION

It was a good and welcome move by different operating teams in varied backgrounds in the North East India to join hands to develop a plan of the operating environment in North East India for both the rural as well as the urban settings. All had innovations in place. All had shown a commitment to their procedures and held up the principle of "Primum -Non-necere". At the end, a real procedural SOP could be obtained which demarcated the rural as well as the urban differences. The model can safely be designated as the '**Assam Model of safety in COVID-19 times surgery**'. We offer the SOP to anyone who wants to follow and no copyrights to whatsoever we suggested in this paper. Let mankind win.

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Contribution of authors: The study was conceived, designed by Dr Narendra Nath Ganguly MS, PhD, Associate Professor and in-charge of the Department of Surgery, JMC, Jorhat. We declare that this work was done by the author(s) named in this article and all liabilities about claims relating to the content of this article will be borne by the authors.

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