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Clinical Paper
Head and Neck Oncology

Increased tracheostomy rates in head and neck cancer surgery during the COVID-19 pandemic

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Abstract. Surgical practice during the coronavirus disease 2019 (COVID-19) pandemic has changed significantly, without supporting data. With increasing experience, a dichotomy of practice is emerging, challenging existing consensus guidelines. One such practice is elective tracheostomy. Here, we share our initial experience of head and neck cancer surgery in a COVID-19 tertiary care centre, emphasizing the evolved protocol of perioperative care when compared to pre-COVID-19 times. This was a prospective study of 21 patients with head and neck cancers undergoing surgery during the COVID-19 pandemic, compared to 193 historical controls. Changes in anaesthesia, surgery, and operating room practices were evaluated. A strict protocol was followed. One patient tested positive for COVID-19 preoperatively. There was a significant increase in pre-induction tracheostomies (28.6% vs 6.7%, $P = 0.005$), median hospital stay (10 vs 7 days, $P = 0.001$), and postponements of surgery (57.1% vs 27.5%, $P = 0.01$), along with a significant decrease in flap reconstructions (33.3% vs 59.6%, $P = 0.03$). There was no mortality and no difference in postoperative morbidity. No healthcare personnel became symptomatic for COVID-19 during this period. Tracheostomy is safe during the COVID-19 pandemic and rates have increased. Despite increased rescheduling of surgeries and longer hospital stays, definitive cancer care surgery has not been deferred and maximum patient and healthcare worker safety has been ensured.

Key words: coronavirus infections; COVID-19; tracheostomy; head and neck neoplasms; pandemics.

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Introduction

The coronavirus disease 2019 (COVID-19) pandemic took the world by surprise and has challenged the healthcare systems of several countries. As little seems to have worked

against the low virulence and high transmission rates of the causative virus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)¹, most countries have resorted to mass lockdowns and the restriction of activities in order to slow down the transmission of

the disease and buy time to prepare and develop definitive strategies.

This pandemic has disrupted routine clinical practice worldwide, with hospitals preparing to handle increasing numbers of COVID-19 cases. Furthermore, no signs

of a decline in incidence of COVID-19 have been seen in many countries, such as India. Surgery remains the mainstay of treatment for most solid malignancies; hence, surgery cannot be deferred indefinitely. As a result, routine practices have evolved in multispecialty government teaching hospitals to accommodate maximum protection for healthcare professionals and patients, while simultaneously not compromising optimal cancer care, as most of these hospitals are concurrently taking care of COVID-19 patients.

India reported its first case of SARS-CoV-2 infection on January 30, 2020 and declared a nationwide lockdown on March 23, 2020. The 'unlock' was initiated on June 1, 2020 and since then the country has seen a steep increase in the number of COVID-19 cases on a daily basis. As of July 10, 2020, a total of 793,802 cases had been reported. The University Hospital of Banaras Hindu University (BHU), Varanasi, which is also known as Sir Sunderlal Hospital, was declared as the tertiary COVID-19 facility for all 15 eastern districts of the state of Uttar Pradesh, catering to a population of approximately 231.5 million². Most of the routine services at the hospital, including cancer surgeries, came to a complete standstill on March 23, 2020. Only emergency services continued to function along with the COVID-19 facility. The Department of Surgical Oncology continued to run outpatient clinics and chemotherapy facilities in spite of the lockdown in order to provide cancer care. From May 19, 2020 it was permitted to reopen the operation rooms (ORs) at partial capacity (for two out of five days a week, two tables per day), as the majority of the hospital resources were diverted towards functioning of the COVID-19 facility.

A great many articles were published in the medical literature during the initial days of the COVID-19 pandemic describing the dos and don'ts of changes in medical practice, without supporting data³⁻⁵. This led to differences amongst surgeons, anaesthetists, and the hospital administration regarding the topic of cancer surgery and its unavoidable requirement. More scientific data is, however, now available on this illness, guiding us to cope safely with the changed situation. In this article we share our initial experience of head and neck cancer surgery in a COVID-19 tertiary care centre, with special emphasis on changes to the protocols of surgery, anaesthesia, and pre- and postoperative care and their impact on short-term outcomes.

Patients and methods

This was a prospective study of the first 21 patients with head and neck cancer who underwent surgery during the COVID-19 pandemic between May 19, 2020 and June 30, 2020 (group A). These patients were compared to 193 historical control patients who underwent surgery for head and neck cancer between March 2019 and February 2020 (group B). The aim was to identify the changing trends in operative practice as compared to pre-COVID-19 times. These changes in practice were further classified into three categories: (1) anaesthesia-related changes; (2) surgery-related changes; and (3) OR-related changes.

A standard protocol was formulated and was strictly adhered to when a patient was admitted for surgery. On admission, all patients underwent reverse transcriptase polymerase chain reaction (RT-PCR) testing for COVID-19 in addition to a non-contrast computed tomogram (NCCT) of the chest. The results of RT-PCR took an average of 2 days to be reported and during this period of time the patients were kept in a 'holding ward'. The holding ward facility admitted patients at only half its actual capacity, maintaining the norms of social distancing. The average distance between two beds in this area was 2 meters and the duty staff all wore full personal protection kit. If the RT-PCR and NCCT chest were negative for signs of COVID-19 illness, these patients were then moved to the surgical oncology wards. Only those patients who tested negative for COVID-19 were considered for surgery. Patients who tested positive for COVID-19 were referred to the COVID-19 facility and were asked to attend for follow up 14 days later with a negative COVID-19 test result or once they were asymptomatic, whichever was later³.

All standard precautions against COVID-19 transmission were followed in the wards and in the OR. Due to extremely high ambient temperatures (40–45), the use of non-centralized air conditioners with filters and air coolers was unavoidable. Aerosol-generating procedures (AGPs) like nebulization, the use of electric drills or saws, and bronchoscopies were avoided in the OR, unless absolutely indicated; when unavoidable, these were done with full precautions and glass/plastic partitions. Only patients with an American Society of Anesthesiologists (ASA) status of ASA 1, 2, or 3 were selected, as these patients were not likely to require postoperative intensive care admission⁶.

A pre-anaesthetic check (PAC) was not performed for any patient, as all routine services were suspended. Patients were evaluated by a junior anaesthesia resident during the evening prior to surgery, who consulted the consultant anaesthetist by telephone, while the senior consultant anaesthetist reviewed the cases on the morning of surgery before induction. World Federation of Societies of Anaesthesiologists guidelines were stringently followed in the OR⁷. The ease of intubation was evaluated by modified Mallampati classification^{8,9}. Rapid or ultra-rapid sequence induction was preferred. A video laryngoscope was used in all cases with adequate mouth opening to guide nasal intubation. In patients with trismus, no attempt was made at blind, retrograde, or bronchoscopy-guided awake intubation. Instead, a tracheostomy under total intravenous anaesthesia (TIVA) was performed. Minimal OR personnel were allowed to remain present at the time of intubation. A HEPA (high-efficiency particulate air) filter was connected to the patient-end of the breathing circuit and also between the expiratory limb and the anaesthesia machine. All ventilatory circuits were discarded after the procedure.

After discussion in the multidisciplinary tumour board, induction chemotherapy was given to those patients on the waitlist with prolonged wait-times, especially those with wet cT4a lesions with skin involvement and oedema¹⁰, who might have progressed if surgery had been postponed.

Informed written consent and special COVID-19 consent were obtained from all patients regarding the unknown (and possibly increased) risks of surgery during the pandemic. Airborne precautions were used in the OR¹¹. Patients with defects requiring restoration were offered only pedicled flaps to avoid excessively long anaesthesia and surgery duration.

After the completion of surgery, once the patient had been moved to the recovery room, the operation table, floor, lights, equipment, and trolleys in the OR were thoroughly wiped down with 1% sodium hypochlorite solution and left for 10 minutes. All reusable metal instruments were washed and scrubbed to clear off any blood present and were then soaked in 1% sodium hypochlorite solution for 30 minutes for disinfection before autoclaving¹². The turnaround time, i.e. the time spent in between cases to prepare the OR for the next patient, was recorded for group A. The turnaround time for group B was calculated by taking the historical median recorded by the OR staff. Postoperative morbidity was graded

according to the Clavien–Dindo classification¹³. Major morbidity included only Clavien–Dindo grades 3 and 4.

The data analysis was done using IBM SPSS Statistics version 21.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as the median with range and categorical variables as frequencies and percentages. A two-sided alpha of <0.05 was considered significant.

Approval for this study was obtained from the Institute Ethics Committee Banaras Hindu University and the study was performed in accordance with the Declaration of Helsinki of 1975, revised in 1983¹⁴. The manuscript was prepared following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines¹⁵.

Results

A total of 21 patients with head and neck cancers underwent surgery over the 6-week period between May 19, 2020 and June 30, 2020. These patients were compared to 193 historical controls. One pa-

tient tested positive for COVID-19 on admission and remained positive after 14 days. His surgery was electively postponed until he tested negative (as advised in the consensus guidelines). The clinical and perioperative parameters observed are shown in Table 1.

The median age of the patients operated on during the COVID-19 era (group A) was 49 years, as compared to 47 years in the control patients (group B). Twelve of the 21 patients (57.1%) in group A had their surgery postponed in comparison to 53 of 193 control patients in group B (27.5%) ($P=0.01$). In group A, six of 21 patients (28.6%) underwent an elective preoperative tracheostomy compared to 13 of 193 in group B (6.7%) ($P=0.005$).

All patients with a modified Mallampati classification score of ≥ 3 required a tracheostomy, showing a strong correlation (Pearson's correlation coefficient of 0.705; $P < 0.001$).

The median turnaround time was 1 hour for group A as compared to 20 minutes for group B.

Group A had more early cancers (T1 and T2 stage) compared to group B (52.4% vs 33.7%, $P=0.05$), and also required a significantly lesser number of flap reconstructions (33.3% vs 59.6%; $P=0.03$). The level of major morbidity was similar in the two groups, i.e. 14.3% in group A and 21.2% in group B, although the median hospital stay was significantly longer in group A (10 days) than in group B (7 days) ($P=0.001$). However, there was no re-exploration, intensive care unit admission, or perioperative mortality in group A.

During the study period, no patients or healthcare workers were found to be symptomatic for COVID-19.

Discussion

The results of this study show many changing trends in head and neck cancer practice during the COVID-19 times. A significant increase in the postponement of scheduled surgeries during the COVID-19 period was seen when compared to the historical cohort (57.1% vs 27.5%, $P=0.01$). This may be attributed to the increased time per patient from induction to leaving the OR and the decreased efficiency while working with personal protective equipment (PPE). In between cases, the time taken to clean and prepare the OR for the next patient (turnaround time) was also significantly increased. This led to a decrease in the total number of surgeries that could be performed per table per day. Postponements due to non-surgical causes could be attributed to the cessation of PAC clinics in the hospital. In these clinics, patients are examined by a senior anaesthetist well in advance, allowing more effective optimization of comorbidities prior to surgery.

Another significant change was the increased rate of tracheostomy prior to induction of the patient. In group A, six out of 21 patients (28.6%) underwent an elective tracheostomy compared to 13 out of 193 patients (6.7%) who required a tracheostomy in group B ($P=0.005$). This finding showed a significant correlation with modified Mallampati classification type 3, i.e. all of the patients in whom only the base of the uvula or soft palate was not visible were electively tracheostomized to avoid repeated attempts that would generate unintended aerosols. Advice against the use of tracheostomy, which is also an AGP, has been given by Coccolini et al.¹⁶ and in the consensus guidelines for head and neck surgery during COVID-19 times³.

Table 1. Perioperative characteristics.

	Group A (COVID-19 era) (<i>n</i> = 21)	Group B (Pre-COVID-19 era) (<i>n</i> = 193)	<i>P</i> -value
Age in years, median (range)	49 (35–82)	47 (17–80)	0.58
Sex			0.06
Male	14 (66.7%)	165 (85.5%)	
Female	7 (33.3%)	28 (14.5%)	
Preoperative chemotherapy	10 (47.6%)	71 (36.8%)	0.35
Postponement (number of times)	12 (57.1%)	53 (27.5%)	0.01
Tracheostomy	6 (28.6%)	13 (6.7%)	0.005
Site			0.2
Buccal mucosa	4 (19.0%)	55 (28.4%)	
Hard palate	0 (0%)	5 (2.6%)	
Lower alveolus	4 (19.0%)	39 (20.2%)	
Upper alveolus	1 (4.8%)	5 (2.6%)	
Lip	2 (9.5%)	21 (10.9%)	
Maxilla	1 (4.8%)	3 (1.6%)	
Neck	0 (0%)	5 (2.6%)	
Parotid	1 (4.8%)	5 (2.6%)	
Retromolar trigone	0 (0%)	11 (5.7%)	
Thyroid	0 (0%)	17 (8.8%)	
Tongue	8 (38.1%)	27 (14.0%)	
Flap reconstruction	7 (33.3%)	115 (59.6%)	0.03
Hospital stay in days, median (range)	10 (1–19)	7 (2–37)	0.001
pT stage			0.09
0	0 (0%)	8 (4.1%)	
1	3 (14.3%)	9 (4.7%)	
2	9 (42.9%)	48 (24.8%)	
3	2 (9.5%)	25 (13%)	
4	7 (33.3%)	103 (53.4%)	
pN			0.28
0	9 (42.9%)	95 (49.2%)	
1	8 (38.1%)	61 (31.6%)	
2	2 (9.5%)	32 (16.6%)	
3	2 (9.5%)	5 (2.6%)	
Morbidity			0.57
Clavien–Dindo grades 3 and 4	3 (14.3%)	41 (21.2%)	

Results are presented as *n* (%), unless indicated otherwise.

The technique of tracheostomy was modified during the COVID-19 pandemic. The procedure was performed as usual under the effect of propofol, and once the trachea was dissected and the pre-tracheal fascia was incised, succinylcholine was given to relax the patient and suppress the cough reflex¹⁷. Following this, the trachea was incised, minimizing aerosol formation, by obviating cough. In our experience, this technique is controlled and extremely safe and prevents repeated attempts at blind nasal intubation, unrelaxed retrograde intubation, or awake fiberoptic-guided intubation. Multiple failed attempts at intubation may also increase the likelihood of the patient going into bronchospasm and complicating further management, as nebulization has also been contraindicated during these times. Use of neuromuscular blocking agents for tracheostomy has also been described and found to be useful by McGrath et al.¹⁷.

There were more cases of early cancers with T1 and T2 lesions in group A, and consequently a significantly lesser requirement of flap reconstruction. Initially only early lesions were selected in order to facilitate shorter surgeries and to determine the feasibility and smooth functioning of the whole system in the face of the COVID-19 threat. Once the whole unit became acquainted with the protocol, more advanced and time-consuming cases were treated. Another reason for the decreased use of flap reconstruction in group A was that a higher percentage of patients underwent surgery for oral tongue cancers with surgical defects that could be closed primarily compared to pre-COVID-19 times: 38.1% (8/21) vs 14.0% (27/193). This observation is independent of the use of neoadjuvant chemotherapy.

The median hospital stay was significantly longer in group A, i.e. 10 days (range 1–19 days) compared to 7 days (range 2–37 days) in group B ($P = 0.001$). This was obviously due to the waiting period for the RT-PCR test result and the increased postponements that were seen during the COVID-19 period. There were also a few occasions where the swabs were repeated when the results were inconclusive. This also led to an unavoidable increase in the hospital stay.

Nevertheless, there was no significant difference in major morbidity between the two groups. There was also no perioperative mortality in either group A or group B.

The results of this study are in concordance with the data from most other

centres^{18,19}, which clearly show that the postoperative outcomes remain unchanged with no added risk or a minimal risk of SARS-CoV-2 infections in healthcare personnel. Iyer et al. reported that there was a reduction in number of cases (overall operative caseload) to about 60% of the pre-COVID-19 times in order to maintain adequate safety and implement protective measures for COVID-19 transmission²⁰.

This study has some limitations, including the small number of patients undergoing surgery during the COVID-19 pandemic. However, the primary intention of the study was to report the changes in clinical practices while operating in COVID-19 times, while ensuring maximal safety for healthcare professionals and patients alike.

In conclusion, significant changes have been made in clinical practice while operating for head and neck cancers during the pandemic when compared to the pre-COVID-19 times. Tracheostomy is a safe procedure during the COVID-19 pandemic and rates of tracheostomy have increased during COVID-19 times. Although an increase in turnaround time and length of hospital stay have been recorded, curative treatment has not been deferred for these patients and maximal safety for the patients and hospital personnel has been ensured.

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Competing interests

None.

Ethical approval

Ethical approval was obtained from the Institute Ethics Committee Banaras Hindu University (Letter Number DEAN/2020/EC/2027).

Patient consent

Consent not applicable.

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