Head and neck cancer surgery during the coronavirus pandemic: a single-institution experience

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Abstract

Objective. The coronavirus disease 2019 pandemic resulted in the cessation of elective surgery. The continued provision of complex head and neck cancer surgery was extremely variable, with some UK centres not performing any cancer surgery. During the pandemic, Guy’s and St Thomas’ NHS Foundation Trust received high numbers of coronavirus disease 2019 admissions. This paper presents our experience of elective complex major head and neck cancer surgery throughout the pandemic.

Methods. A head and neck cancer surgery hub was set up that provided a co-ordinated managed care pathway for cancer patients during the pandemic; the Guy’s Cancer Centre provided a separate, self-enclosed coronavirus-free environment within the hospital campus.

Results. Sixty-nine head and neck cancer patients were operated on in two months, and 13 patients had a microvascular free tissue transfer. Nosocomial infection with coronavirus disease 2019 was detected in two cases (3 per cent), neither required critical care unit admission. Both patients made a complete recovery and were discharged home. There were no deaths.

Conclusion. Performing major head and neck surgery, including free flap surgery, is possible during the pandemic; however, significant changes to conventional practice are required to achieve desirable patient outcomes.

Introduction

The coronavirus disease 2019 (Covid-19) pandemic had a sudden and significant negative impact on healthcare throughout the world, and continues to have a devastating effect. The UK was one of the worst affected countries in Europe, with the impact delayed after Italy and Spain. In response to the pandemic, the National Health Service (NHS) enacted a national response on 17th March 2020. This resulted in the cancellation of elective non-urgent operations and the urgent discharge of medically fit patients. The purpose was to free up in-patient bed capacity and prepare expanded critical care facilities, in order to prevent health services becoming overwhelmed. Evidence was also emerging from China regarding the potential for harmful effects of nosocomial Covid-19 infection on cancer patients in the post-operative period.1,2

For the majority of the UK, elective head and neck cancer surgery was temporarily suspended while the NHS adjusted to the pandemic and reviewed the implications for continued care. Guy’s and St Thomas’ NHS Foundation Trust has one of the largest UK head and neck cancer centres, as well as one of the UK’s high-consequence infectious disease centres. The hospital was able to utilise a separate ‘cold’ elective facility within its campus to provide coronavirus-free care during the pandemic.

We present our experience of elective complex major head and neck cancer surgery conducted throughout the Covid-19 pandemic.

Materials and methods

In response to the Covid-19 crisis, a centralised cancer hub was set up at Guy’s and St Thomas’ NHS Foundation Trust covering South East London. This provided a co-ordinated managed care pathway for cancer patients during the pandemic. The Guy’s Cancer Centre, a self-enclosed building that jointly houses an independent sector care facility, was commandeered in order to provide a separate coronavirus-free environment. Within this building, there are three in-patient wards, four operating theatres and a four-bed critical care unit facility. This hospital centre usually performs a high volume of private head and neck cancer surgical procedures, including robotic surgery.

The period of reporting ran from 17th March 2020 to 17th May 2020. During this same time period, which represented the peak of the Covid-19 pandemic in the UK, the hospital received 1500 in-patients and had 180 admissions to the intensive treatment unit with coronavirus infections.
Pre-operative pathway

Additional treatment planning steps were introduced to the care pathway implicating patients for whom surgery would normally be recommended as the treatment modality following standard multidisciplinary team (MDT) decision-making. Patient’s risk profiles were assessed according to the new government guidance based on their co-morbidities and the potential negative effect that Covid-19 infection might have. If the health risks in terms of co-morbidity index were deemed too high, then patient care was directed to a non-surgical alternative pathway. The potential need for a post-operative critical care unit bed was also calculated in order to plan for post-operative critical care unit demand. An enhanced consenting process was utilised, which included agreed levels of care in the post-operative period, with some patients electing not to receive critical care unit care if their condition deteriorated after surgery.

All patients were instructed to adopt a strict 14-day self-isolation protocol in order to minimise the risk of acquiring Covid-19 infection in the pre-operative period. In order to proceed to surgery, patients had to have negative swabs during the pre-assessment phase 48 hours prior to admission. If a patient had a positive Covid-19 swab, surgery was delayed by 14 days; subsequent swabs were taken and surgery was delayed until two negative results were confirmed. If the staging computed tomography scan of the chest identified incidental Covid-19 pneumonitis, then the surgery was delayed for 14 days, even if swab results were negative.

Peri-operative pathway

The surgical team was restricted to consultant surgeons only; junior doctors were excluded in order to reduce the number of staff members in the operating theatre. As head and neck surgery and airway management was deemed a high-risk aerosol-generating procedure, full personal protection equipment (PPE) was worn by all operating theatre staff.

The anaesthetic protocol (Appendix 1) was devised to minimise aerosol generation and potential exposure to undetected Covid-19 infection in patients with false negative swab test results. This meant that all airway techniques for managing these patients would have to be modified in order to minimise the risks to all operating theatre staff and to optimise patient safety. This involved the development of PPE and airway management guidelines in the form of action cards and checklists. We also developed a mandatory in situ simulation training programme for all operating theatre staff, which addressed use of PPE, donning and doffing techniques, intubation techniques, and failed intubation drills.3,4

All patients were intubated in the operating theatre, with the anaesthetist and assistant wearing full PPE. Once the endotracheal tube was safely in place, a waiting period of 20 minutes was adopted prior to the surgical team entering the operating theatre, which would allow for adequate air exchanges to occur and to minimise exposure to any aerosol generation.

It was then considered safe to start surgery, following the completion of the World Health Organization checklist. Upon the completion of surgery, patients were extubated in the operating theatre. A 20-minute air-exchange interval was again used prior to transfer of the patient to the recovery room. Deep cleaning was performed between cases.

The adoption of this ‘coronavirus-free’ pathway meant that there was a significant increase in the time taken before, during and after surgery, and hence a reduction in operating theatre productivity as compared to pre-coronavirus times.

Results

During the two-month study period, we operated on 69 head and neck cancer patients. The mean age was 52 years (range, 24–88 years). Ten per cent of patients (n = 7) were aged over 70 years and hence in the at-risk group based on age criteria alone. The proportion of patients in the shielding group based on co-morbidities was 30 per cent.

The head and neck procedures performed during the study period are listed in Table 1. Two of the patients who were selected for surgery chose not to accept the offer because of fears of contracting coronavirus and instead opted to postpone their surgery. Three patients tested positive on pre-operative screening and therefore had their surgery postponed for a period of three weeks; they subsequently had two negative swabs.

Eleven patients required an elective stay in the critical care unit post-operatively, with a mean length of stay of 2 days (range, 1–6 days). Ten of these patients had a covering tracheostomy inserted at the time of surgery. All were successfully de-cannulated; the mean time for removal of the tube was 3 days. Complications, classified according to the Clavien–Dindo criteria (Table 2),5 were seen in 16 per cent of cases (n = 11). There were no deaths in this series of patients. The mean length of hospital stay was 4 days (range, 1–35 days), with all patients being successfully discharged home.

Thirteen patients underwent microvascular free tissue transfer surgery (performed by two plastic surgeons and one

### Table 1. List of head and neck procedures performed

| Main index procedure                                      | n  |
|-----------------------------------------------------------|----|
| Partial glossectomy neck dissection + free flap           | 8  |
| Partial glossectomy or floor of mouth resection + primary closure | 11 |
| Wide local excision of skin + free flap                  | 3  |
| Total thyroidectomy + neck dissection                     | 10 |
| Thyroid lobectomy                                         | 11 |
| Panendoscopy (diagnostic)                                 | 13 |
| Total parotidectomy                                       | 4  |
| Transoral robotic surgery                                 | 5  |
| Lateral temporal bone resection + flap                    | 2  |
| Transoral laser microsurgery                              | 2  |

### Table 2. List of head and neck complications encountered

| Complication                                                | n (Clavien–Dindo grade) |
|-------------------------------------------------------------|-------------------------|
| Haematoma                                                   | 3 (grade 2)             |
| Wound infection                                             | 2 (grade 1)             |
| Covid-19 hospital-acquired chest infection                  | 2 (grade 2)             |
| Hypocalcaemia                                               | 1 (grade 2)             |
| Poor pain control                                           | 2 (grade 1)             |
| Wound dehiscence                                            | 1 (grade 2)             |

Covid-19 = coronavirus disease 2019

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oral and maxillofacial surgeon), all were anterolateral thigh flaps and there were no flap failures.

Post-operative nosocomial infection with Covid-19 was detected in 3 per cent of cases (n = 2); neither case required critical care unit admission. Both patients made a complete recovery and were discharged home.

During the study period, one member of staff developed symptoms of Covid-19 infection and subsequently tested positive. A full recovery was made and this individual returned to work after a period of self-isolation.

Discussion

The surgical management of patients with head and neck cancer poses a unique challenge for clinicians; this was particularly exacerbated by the pandemic. Traditionally, these patients disproportionately fall into the high-risk ‘shielded’ group, because of their age, co-morbidities, gender and ethnicity. We normally see a 2:1 male-to-female preponderance, group, because of their age, co-morbidities, gender and ethnicity. Patients disproportionately fall into the high-risk group, because of their age, co-morbidities, gender and ethnicity. Traditionally, these patients disproportionately fall into the high-risk ‘shielded’ group, because of their age, co-morbidities, gender and ethnicity. We normally see a 2:1 male-to-female preponderance, and a high number of patients aged over 70 years. In our study group, we saw a lower proportion of older and high-risk cases than normal, which likely represents a combination of factors. The enhanced selection criteria we adopted during the pandemic meant that high-risk patients with multiple co-morbidities were not operated on.

Some high-risk and older patients were initially selected for non-surgical treatments. However, for these patients, non-surgical anti-cancer treatments such as chemotherapy and radiotherapy were de-escalated, in order to reduce risks of acute toxicity during the pandemic. This resulted in a difficult dilemma for oncologists and surgeons in the head and neck MDT, who had to consider the potential effect of Covid-19 infection, in addition to the risks and benefits of cancer treatments.

When the initial peak of the pandemic passed, we began to see a return to routine practice, and patients with higher-risk profiles were being selected for surgery.

During the first two months of the pandemic, we operated on 69 head and neck cancer patients. This represents a reduction in overall activity of approximately 50 per cent compared to normal working practice. This level of head and neck surgical activity in an acute hospital during the pandemic is quite unique, as most head and neck units in the UK suspended head and neck surgery. Some UK head and neck centres (Royal Victoria Hospital, East Grinstead) that were ‘cold’ elective centres were able to continue to deliver normal levels of activity, as they were able to offer a ‘coronavirus-free’ pathway.

We observed a low rate of nosocomial Covid-19 infections, and believe this was a result of having the separate isolated building, which allowed for a coronavirus-free pathway. This separate building was within the hospital campus, with easy access to acute medical and surgical specialty expertise. This access to expertise is necessary for cancer care, as many cancer patients have complex co-morbidities that require input from renal, respiratory and cardiac medical specialties during their stay. Other head and neck centres tried to relocate into the independent sector in order to facilitate cancer surgery. However, the lack of familiarity in managing complex cancer cases meant that it was unsuccessful. We were fortunate in that the independent sector facility chosen was used to performing complex cancer surgery, and it had the necessary skill mix in terms of operating theatre and ward nursing staff, which allowed for safe patient care.

The strict pre-operative testing and 14-day self-isolation strategy was an important factor in reducing the risk of coronavirus infection. Patients were advised against taking public transport on their way into hospital and were admitted the day before in order to undertake enhanced screening. The unrestricted availability of PPE and adherence to peri-operative protocols also played a key role.

Length of hospital stay following major head and neck cancer surgery is usually prolonged, which potentially puts patients at risk of nosocomial coronavirus infection when the hospitals are full of infected patients. The critical care unit is usually needed in the early post-operative period and the lack of available critical care unit beds presented a challenge. Patients undergoing major head and neck surgery often have a temporary tracheostomy inserted to protect the airway during the procedure and in the post-operative period.

In addition, upper aero-digestive tract operations presented a potentially increased risk to healthcare professionals of acquiring Covid-19 infection from patients, as this type of surgery transgresses the airway mucous membranes and has an increased risk of aerosol generation. In our group, we saw a short mean length of stay and low critical care unit bed occupancy rate. Again, this likely represents the highly selective process undertaken in the pre-operative pathway.

National specialty guidance was produced for the provision of head and neck cancer services during the period studied. This guidance was intended to direct and support decisions made locally or regionally within head and neck MDTs. Recommendations made in these guidelines included: the cessation of thyroid cancer surgery, the prioritisation of day-case surgery where feasible (e.g. wide local excision without reconstruction), the restriction or cessation of surgical procedures requiring post-operative high-dependency unit or intensive treatment unit care, and a reduction in the length of surgery where possible (e.g. the use of local or pedicle flaps rather than free flaps).

While most of these recommendations represent a common-sense approach to managing patients during the pandemic, deviation from the standard of care, including the avoidance of free flaps, may result in worse outcomes for the patient in terms of function and form following head and neck cancer surgery. Hence, we elected to offer microvascular free flap surgery on a case-by-case basis. Given that there were just 13 free flap cases in this series, it is difficult to draw meaningful conclusions; however, we can at least note the observation that microvascular reconstructive surgery was performed without significant problems. We performed thyroid cancer surgery during the pandemic after a detailed risk assessment, and we decided that most of these patients would require only a short stay and would not need intensive care unit facilities.

Airway management in this group of patients can be challenging, even in normal times; however, when adding in the risks to operating theatre staff associated with aerosol generation and potential Covid-19 exposure, the challenges are even greater. In order to minimise these risks and to optimise safe airway management, protocols and simulation training were established. This included Covid-19 specific modifications to techniques for intubation, performed when awake or asleep, and extubation. For example, we avoided the use of...
high-flow nasal oxygenation techniques and jet ventilation, and attempted to minimise patient coughing during airway management.

Tracheostomy for upper airway protection is usually considered mandatory for major head and neck surgery. Concerns regarding the effect of tracheostomy during the pandemic were raised. The tracheostomy could potentially be a portal of entry for coronavirus infection, and could also be a source of infection to staff performing the procedure in patients that carried occult coronavirus infection. In our group, 10 patients underwent a tracheostomy, all of them were open procedures. There were no problems noted regarding tracheostomy insertion.

The national recommendations also suggest the exclusion of junior doctors and medical students from operating theatres during the pandemic. We adopted this protocol for the first two months, but have subsequently allowed the return of trainees in order to offer training and the experience of operating in full PPE. The impact of stopping elective surgical activity, and the effects of exclusion and re-deployment on junior doctor trainees, are yet to be fully elucidated.

Attempts to return surgical activity to normal levels and manage any backlog of delayed cases will represent a challenge to surgical services, with a significant strain on hospital resources.

While we recognise this is a retrospective study with a small sample size, with all the potential biases associated with this, our experience is very different from the initial reports from China and Italy where high morbidity and mortality rates were seen in the post-operative period. In addition, their studies involved a significant volume of head and neck cancer surgery cases during the pandemic, which was not seen in UK centres.

In conclusion, we elected to continue performing head and neck cancer surgery during the Covid-19 pandemic. We were highly selective in identifying the low-risk candidates, in order to mitigate against possible nosocomial infection and complications. We adopted a ‘coronavirus-free’ pathway, with strict isolation and testing pre-operatively. We have seen low morbidity and no mortality in this highly selected group of patients. Performing major head and neck surgery, including free flap surgery, is possible during a coronavirus pandemic; however, it requires significant changes to conventional practice in order to achieve desirable patient outcomes.

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Competing interests. None declared

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Appendix 1. Covid-19 airway management action cards

Elective surgical procedures during Covid-19 pandemic

Objective
Surgery during the Covid-19 pandemic requires planning. Use this card to assist your morning briefing, PPE requirements vary with anaesthetic and surgical techniques. It is essential that PPE is discussed at the briefing and reviewed regularly.

1. Prepare teams
(a) Assemble all team members
(b) Perform WHO team brief (see ‘General principles’)
(c) Check anaesthetic plans regarding airway choices, including for sedation cases (see ‘Airway choices’)
(d) Check PPE requirements with all team members (see ‘PPE requirements’ and ‘T2-8: Recommended PPE requirements for different types of surgery’)
(e) Check where patients in your theatre will be recovered

2. Prepare theatre
(a) Check anaesthetic machine, and drug and fluid stock levels
(b) If TIVA is planned, check you have a BIS monitor and sufficient supplies of drugs
(c) If volatile maintenance, check you have a filled vapouriser

3. Prepare donning and doffing stations
(a) Check the donning and doffing stations are clearly signposted
(b) Check all staff know where the donning and donning stations for this theatre are located
(c) Check the doffing station has: an empty bin, alcohol gel and a receptacle for non-disposable PPE (e.g. PAPR hoods), if required

4. Prepare anaesthetic equipment and drugs
Prepare anaesthetic equipment and drugs on the intubation trolley.

5. Don PPE
Don PPE (see ‘T2-1: Donning PPE for a Covid-19 patient in theatre’).

6. Induce anaesthesia in theatre
(See ‘T6-2: Preparation for elective intubation in theatre’ and ‘T6-3: Intubation of elective surgical patients in theatre.’)

General principles
• On arrival, the patient must be transferred directly into the allocated theatre
• Only essential people should be in theatre during the procedure; a runner should be stationed in the anaesthetic room. All staff must be trained in safe PPE use (use ‘Airway choices’)

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Airway choices
To minimise leaks, intubation is preferred, but supraglottic airways may be used at the discretion of the anaesthetist after an appropriate risk assessment.

If a supraglottic airway is used:
• Treat as AGP for the duration of the surgical case
• Use only manual or spontaneous mode; to minimise airway leaks, do not use IPPV, pressure support or PEEP
• Occlude the drain port of an iGel device with tape before insertion
• Remove the airway in theatre

If sedation is planned:
• Not predicted to need airway intervention: standard PPE
• Likely to need airway intervention (including suctioning): AGP PPE (see ‘PPE requirements’)

PPE requirements
• The two main forms of PPE in theatre are: ‘AGP’ and ‘standard’
• Staff wearing AGP PPE should enter the room immediately after intubation
• Staff wearing standard PPE must not be in the room during AGPs and for a period of time afterwards as determined by the room ventilation: HCA sites = 10 minutes; Guy’s and St Thomas’ sites = 20 minutes

AGP PPE: FFP3 mask or PAPR hood, long-sleeved waterproof gown, gloves, face shield and hat.
• AGP PPE is mandatory during and for a period after AGPs

Standard PPE: standard surgical facemask, apron, eye protection and gloves.
• Standard PPE is required when: acting as the anaesthetic room runner; caring for a patient in recovery post-operatively and during recovery transfer
• Standard PPE can be used in the operating theatre where no intra-operative AGP is planned, and the suitable period of time has elapsed after intubation
• Staff in standard PPE must leave before any AGP begins

Intubation of elective surgical patients in theatre
Objective
Intubation of a surgical patient, minimising risk to staff. Only essential staff should enter the room with the patient. These guidelines apply only to elective patients who have been through the hospital Covid-19 screening process.

Intubation in hot room
1. Receive patient on trolley
   (a) Check HME filters at both ends of breathing circuit and Yankauer suction device are available
   (b) Check patient positioning, monitoring, and that room ergonomics are suitable for intubation
   (c) Check landmarks for front of neck airway if airway difficulty predicted

2. Check IV access is adequate
   Check IV access is adequate and functional, then connect IV fluids.

3. Pre-oxygenate for at least 3 minutes with tight seal on mask
   Consider 5 cmH2O PEEP.

4. Apply cricoid pressure if appropriate, then give RSI drugs
   If hypoxia, use low pressure or low volume mask ventilation (two-handed technique).

5. Turn oxygen off before removing mask
   Perform ‘Plan A: Primary intubation’.

6. If intubation is successful...
   If intubation is successful, perform ‘Post-intubation actions’.

7. If laryngoscopy is difficult...
   (a) Insert iGel device and ventilate
   (b) Perform ‘Plan B: Secondary intubation’
   (c) If successful, perform ‘Post-intubation actions’

8. If cannot ventilate via iGel...
   If cannot ventilate via the iGel device, perform ‘Plan C: Mask ventilation’.

9. If cannot mask ventilate...
   (a) Perform ‘Plan D: Front of neck airway’
   (b) Perform ‘Post-intubation actions’

Post-intubation actions
• Connect breathing circuit
• Inflate cuff before ventilation
• Turn oxygen on
• Confirm capnography
• Secure tracheal tube with tie, and note tube depth
• Start sedation or anaesthesia
• Start a timer; staff wearing standard PPE must not enter before an appropriate delay has elapsed
• Check tracheal tube cuff pressure; it must be at least 5 cmH2O above inspiratory pressure, to minimise leaking
• If the circuit must be disconnected, occlude the tracheal tube with a clamp before detaching, and leave the filter on the patient side
• Clean anaesthetic machine and breathing circuit with Clinell disinfectant wipe

Airway plans
Plan A: Primary intubation
• Laryngoscopy with Airtraq camera and screen or videolaryngoscope are preferred
• Direct laryngoscopy may be used if this is the most familiar technique

Plan B: Secondary intubation
• Request Ambu-scope Slim and Aintree Intubating Catheter from clean room
• Load Aintree Intubating Catheter on to Ambu-scope
• Insert Aintree Intubating Catheter via iGel device using Ambu-scope
• Remove Ambu-scope and iGel; leave Aintree Intubating Catheter in trachea
• Intubate over Aintree Intubating Catheter
• Remove Aintree Intubating Catheter

Plan C: Mask ventilation
• Low pressure or low volume mask ventilation
• Two-handed technique to maintain seal

Plan D: Front of neck airway
• Scalpel (size 10 blade)
• Bougie
• Size 6.0 tracheal tube