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BRIEF COMMUNICATION

Impact of COVID-19 pandemic on eye cancer care in United Kingdom

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The COVID-19 pandemic has had an unprecedented impact on the National Health Service in United Kingdom. The UK Ocular Oncology Services evaluated the impact on the adult eye cancer care in the UK. All four adult Ocular Oncology centres participated in a multicentre retrospective review comparing uveal melanoma referral patterns and treatments in a 4-month period during the national lockdown and first wave of the COVID-19 pandemic in 2020 with corresponding periods in previous 2 years. During the national lockdown, referral numbers and confirmed uveal melanoma cases reduced considerably, equalling to ~120 fewer diagnosed uveal melanoma cases compared to previous 2 years. Contrary to the recent trend, increased caseloads of enucleation and stereotactic radiosurgery ($p > 0.05$), in comparison to fewer proton beam therapy ($p < 0.05$), were performed. In the 4-month period following lockdown, there was a surge in clinical activities with more advanced diseases ($p < 0.05$) presenting to the services. As the COVID-19 pandemic continues to mount pressure and reveal its hidden impact on the eye cancer care, it is imperative for the Ocular Oncology Services to plan recovery strategies and innovative ways of working.

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BACKGROUND

Glasgow, Liverpool, London and Sheffield are the four designated National Centres of Excellence in United Kingdom (UK) for adult Ocular Oncology. Patients with suspected intraocular or ocular surface tumours are referred by ophthalmologists across the whole of the UK including England, Scotland, Wales and Northern Ireland to the aforementioned specialist centres using the referral criteria and pathways published by the Royal College of Ophthalmologists.[1]

The most common primary intraocular malignancy managed in these centres is uveal melanoma, of which 90% are choroidal in origin, with the rest involving ciliary body and iris.[2] The incidence of uveal melanoma in the UK is ~5 per million per year;[3] ~650 uveal melanoma cases are diagnosed and treated per year in the UK according to Ocular Oncology Commissioning for Quality and Innovation (CQUIN) Annual Meetings (Personal Communication from CQUIN 2016–2018 annual meetings).

The COVID-19 pandemic has had an unprecedented impact on the NHS. The four Ocular Oncology Services have continued to provide uninterrupted clinical care throughout the pandemic, but a number of the referring ophthalmology and optometry services had ceased routine clinical care. Anecdotal evidence from all the UK Ocular Oncology Services suggested a decline in referral numbers. This is likely the result of government shielding and isolation advice, reduced health-seeking behaviour because of a fear of contracting COVID-19 virus in hospital settings, closure of community optometry services and reduced local eye unit workload.

Aware of these changes the UK Ocular Oncology Services conducted a study to evaluate the impact of the COVID-19 pandemic on eye cancer care with respect to uveal melanoma referral patterns and treatments throughout the pandemic in 2020.

METHODS

In this study, we retrospectively collected data on age, the number of referrals, confirmed cases of uveal melanoma, staging and treatment modalities used for uveal melanoma in a 4-month period between 1st March and 30th June in 2018, 2019 and 2020 as well as 1st July to 31st October 2020 across all the Ocular Oncology centres in the UK. We compared these parameters with data collected for the corresponding 4-month periods in 2018 and 2019 to judge the impact of the pandemic. The period between 1st March and 30th June was considered the worst hit during 1st wave of the COVID-19 pandemic, during which the UK national lockdown was enforced; the majority of elective and non-urgent clinical work ceased in healthcare services in the UK during this time. Post lockdown, most of the referring ophthalmology and optometry services resumed routine clinical care; hence, the period between 1st July and 31st October was assessed for any rebound of workload in the Ocular Oncology Services.

A diagnosis of uveal melanoma was made based on clinical features and examination findings from a dilated slit-lamp fundus examination and multimodal imaging consisting of colour fundus photography, optical coherence tomography, A-scan and B-scan

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Table 1. The number of referrals and uveal melanoma cases between March and June in 2018, 2019 and 2020 and between July and October in 2020 from all of the four Ocular Oncology centres in United Kingdom.

	Mar–Jun 2018	Mar–Jun 2019	Mar–Jun 2020	Jul–Oct 2020
London Ocular Oncology				
Number of referrals	459	472	305	466
Diagnosis of uveal melanoma	102 (22.2%)	102 (21.6%)	59 (19.3%)	90 (19.3%)
Sheffield Ocular Oncology				
Number of referrals	320	313	171	263
Diagnosis of uveal melanoma	70 (21.9%)	63 (20.1%)	51 (29.8%)	46 (17.5%)
Scottish Ocular Oncology				
Number of referrals	59	55	29	34
Diagnosis of uveal melanoma	19 (32.2%)	22 (40%)	8 (27.6%)	14 (41.2%)
Liverpool Ocular Oncology				
Number of referrals	302	352	171	206
Diagnosis of uveal melanoma	70 (23.2%)	108 (30.7%)	40 (23.4%)	63 (30.6%)
Total				
Number of referrals	1140	1192	676	969
Diagnosis of uveal melanoma	261 (22.9%)	295 (24.7%)	158 (23.4%)	213 (22.0%)

Table 2. Treatment modalities for uveal melanoma between March and June in 2018, 2019 and 2020 and between July and October in 2020 from all of the four Ocular Oncology centres in United Kingdom.

	Mar–Jun 2018	Mar–Jun 2019	Mar–Jun 2020	Jul–Oct 2020
Ruthenium plaque brachytherapy	95 (39.6%)	96 (34.2%)	50 (36.5%)	60 (31.6%)
Proton beam radiotherapy	68 (28.3%)	84 (29.9%)	24 (17.5%)	45 (23.7%)
Enucleation	53 (22.1%)	66 (23.5%)	38 (27.7%)	44 (23.2%)
Stereotactic radiosurgery[a]	12	12	9	8
Photodynamic therapy	7	4	5	15
Observation[b]	3	11	7	7
Others	2	8	4	11
Total	240	281	137	190

[a]Only available at Sheffield Ocular Oncology service.
[b]Data not available from London Ocular Oncology service.
Others include local resection, infrared diode and unknown data.

ultrasonography followed by expert consensus from ocular oncology specialists at a multidisciplinary team meeting prior to making treatment decisions.

Descriptive statistics were used to evaluate the data. Categorical variables were tested with χ^2 test. A p value < 0.05 was considered significant.

RESULTS

Six hundred and seventy-six patients (mean age 59 years, range 26–88 years) were referred to the Ocular Oncology Services between March to June in 2020 compared to 1140 and 1192 referrals (mean age 58 years, range 28–91 years) to the services in corresponding periods in 2018 and 2019, respectively. One hundred and fifty-eight cases of uveal melanoma were diagnosed in these 4 months in 2020 compared to 261 and 295 cases in 2018 and 2019, respectively. This correlates to a reduction in referral numbers by 42% (range 34.5–49.1%) and confirmed uveal melanoma cases had a decline of 43.2% (range 23.3–61.0%), equalling to a reduction of 120 cases during the national lockdown compared to the mean of corresponding periods in previous 2 years. Between July and October 2020, referral numbers and uveal melanoma cases rebounded by 43.3% and 34.8%, respectively, compared to the 4 months earlier in the year (Table 1).

In terms of treatment modalities, higher percentages of patients underwent enucleation (27.7%) during the 4-month period between March and June in 2020 compared to the mean of previous 2 years (22.8%) ($p = 0.229$). It was observed that stereotactic radiosurgery, which is currently only available at Sheffield, was performed more frequently in 36% of the oncology patients in Sheffield (9/25 cases) during the 4-month period between March and June in 2020 compared to 27% (12/44 cases) in 2019 and 24% (12/50 cases) in 2018 ($p = 0.352$). Post lockdown, use of stereotactic radiosurgery dropped to 17.4% (8/46 cases) in Sheffield (in comparison to 36% during the lockdown, $p = 0.079$). Proton beam therapy was performed less frequently (17.5%) during the lockdown period compared to the mean (29.2%) ($p = 0.011$) from the same periods in 2018 and 2019 (Table 2).

As per American Joint Committee on Cancer staging for uveal melanoma,[4] the staging spectrum of uveal melanoma cases was comparable between March to June in 2018, 2019 and 2020 (Fig. 1). Compared to these three periods, the number of stage III (including III A, B and C) and stage IV uveal melanoma cases was significantly higher in the post lockdown period between July and October 2020 (13.4 vs. 28.2%, $p = 0.006$).

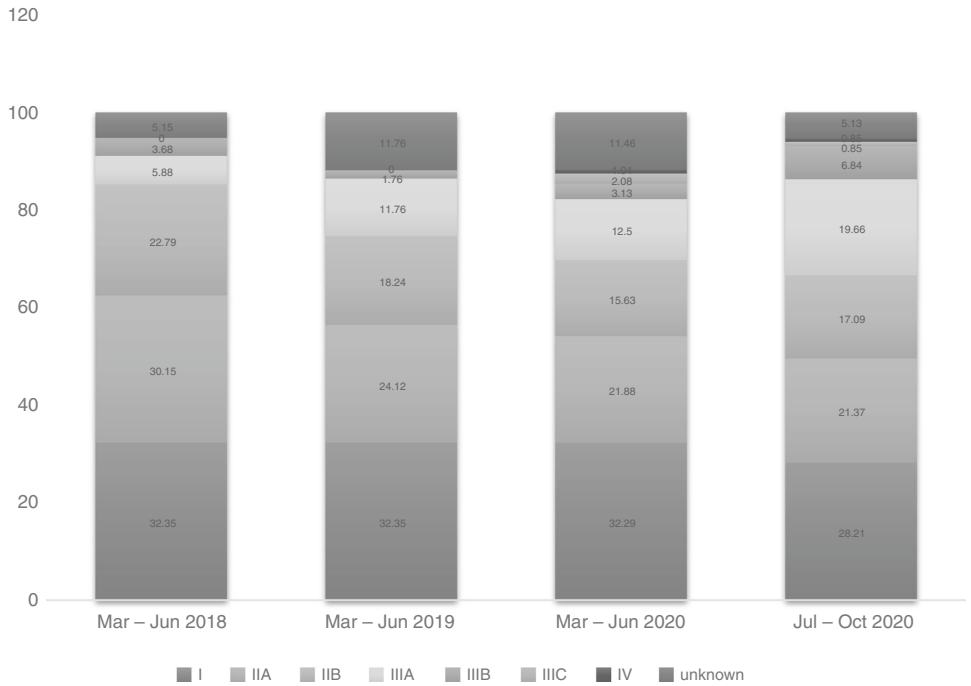

Fig. 1 Staging for uveal melanoma cases in percentage between March and June in 2018, 2019 and 2020 and between July and October in 2020 from all of the four Ocular Oncology centres in United Kingdom.

Fewer oncology cases were performed per theatre session between March to June in 2020 compared to the mean from the identical periods in 2018 and 2019 (2.2 vs. 3.3 cases per session, respectively, in Sheffield, $p = 0.024$; 2.0 vs. 2.3 cases per session, respectively, in Moorfields, $p = 0.657$). Operating theatre data were not available for Liverpool and Glasgow.

DISCUSSION

The COVID-19 pandemic has placed an unprecedented burden on NHS resources during 2020, providing acute care for those affected with the virus. However, there has been a concern that other serious disorders, including the diagnosis and management of cancers, have been adversely affected. We tested this idea in our caseload, in a well-defined service that manages all of the adult oncology cases in the UK, in our most common diagnosis, that of uveal melanoma.

This study confirmed a considerable reduction in both the referral numbers and the newly diagnosed cases of uveal melanoma in the 4-month period of national lockdown compared to the previous 2 years. Uveal melanoma is often discovered after patients seek help with gradual visual symptoms or found incidentally during a routine (often dilated) fundal examination performed for other reasons; far fewer of these examinations were being carried out by optometrists and ophthalmologists during the pandemic due to cessation of their routine clinical care. We postulated that there was a potential issue of a significantly large number of patients with uveal melanoma undiagnosed in the community, which meant it was likely that there would be a surge in the caseload of ocular oncology patients presenting with potentially more advanced disease when the national lockdown was relaxed. This hypothesis was tested after analysing data from the post lockdown period, in which there was a predicted rebound of caseloads to the Ocular Oncology Services and a significantly larger proportion of patients presented with stage III and IV uveal melanoma.

The COVID-19 pandemic has posed challenges for clinicians when it comes to decision-making on the management of intraocular cancer. Contrary to the general trend of using fewer radical treatments and more globe salvage intervention strategies while prioritising patient survival outcome, we observed the opposite during the first wave of the pandemic in the UK. More enucleations ($p > 0.05$) and fewer globe salvage procedures such as proton beam radiotherapy ($p < 0.05$) were performed during the COVID-19 lockdown period compared to the previous 2 years. At the cusp of the COVID-19 pandemic, there was no conscious intention to change treatment strategies to favour more enucleation over globe preserving modalities in the UK or elsewhere,[5,6] although our UK data observed this trend. We could speculate this variation was due to a number of potential factors: patient choice, nature of aerosol-generating procedures in general anaesthesia (GA) and a balance of increased transmission risk of COVID-19 virus during prolonged patient care in hospital settings. However, the disease status of uveal melanoma might not be accountable to the observed differences in treatment modalities as little difference in staging data was found comparing the national lockdown period to the previous 2 years. However, an increasing number of patients presented with more advanced disease post lockdown. This was not a surprise taking into account government lockdown policy, shielding and isolation advice, cessation of routine clinical services from local ophthalmology and optometry practices.

Proton beam radiotherapy regimen involves three-step practices and frequent hospital attendances—firstly surgery under GA where tantalum markers are inserted to allow targeted radiotherapy in one of the four Ocular Oncology centres; attending for treatment planning at the national Proton Beam Centre in Clatterbridge, Liverpool; then 2 weeks later, undergoing a week of fractionated proton beam therapy in Liverpool. Restricted travelling across the country during the lockdown could be a confounding factor. The largest international community of proton beam therapy providers have also recognised these factors and issued practical considerations on the decision-making when listing patients for proton beam therapy.[7] Ruthenium plaque brachytherapy needs hospital admission for up to a week and included two surgical interventions under GA: insertion of plaque, from when the patient stays in a side room as an inpatient, then removal of plaque once the planned radiation dose is delivered. However, the COVID-19 pandemic did not seem to affect the utilisation of ruthenium plaque brachytherapy based on the

experience from the Ocular Oncology centres. One centre (London) converted the majority of GA cases to using deep sedation with local anaesthetic for plaque brachytherapy, insertion of tantalum marker clips and even enucleation to reduce aerosol-generating procedures.

Enucleation under GA generally requires one overnight inpatient stay. Despite this being globe-sacrificing procedure with loss of vision and cosmetic issues, it was evident this treatment strategy was chosen more frequently during the first wave of the pandemic, possibly to reduce hospital contact. The London service developed day-case enucleations: if the surgery took place in the morning under local anaesthetic and sedation, patients were reviewed in the evening and discharged home if medically fit and recovered from surgery with adequate analgesia. No hospital re-admissions were required in this group. Stereotactic radiosurgery was also performed more often in Sheffield during the first wave of the pandemic, as the treatment can be performed under local anaesthetic as a day-case procedure with equally effective treatment outcomes.[8]

There are enormous challenges facing patients with uveal melanoma in terms of management and prioritisation. The American Association of Ophthalmic Oncologists and Pathologists has issued some triage and management guidelines in light of the increased risk of COVID-19 transmission.[5] It is known that the risk of COVID-19 transmission as well as COVID-19-associated morbidity and mortality is particularly high in ocular oncology patients, who are typically over the age of 60 years, likely need surgical intervention under GA and require frequent hospital visits during or post treatment. While there is a fear of risk of transmitting COVID-19 infection to cancer patients, advanced service planning, transparent communication with patients and appropriate COVID-19 infection control protocols are required to minimise these risks.

In conclusion, the surge in workload to the Ocular Oncology Services is likely to continue with an increasing presentation of more advanced diseases as a consequence of hidden impact from the COVID-19 pandemic. This has the potential to overwhelm already reduced clinic capacity due to social distancing, disinfection protocol, staff sickness and isolation requirement. As the COVID-19 pandemic is far from over, it is imperative for the Ocular Oncology Services to plan recovery strategies and innovative ways of working by setting up a better triage system to reduce non-cancerous referrals, improving referral pathways, improving communication with patients and referrers, conducting virtual tele-ophthalmology clinics, creating more theatre and personnel capacity, consideration of deferring post-treatment review to the maximal accepted timeframe while ensuring patient safety.

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AUTHOR CONTRIBUTIONS

Concept and design of the work: H.W., V.C., R.H., V.C., S.M.S.; acquisition, analysis or interpretation of data: H.W., M.E., K.G., M.S.S., B.D., R.A., H.H., R.H., P.C., V.C., P.R., S.M.S. Drafting the manuscript or revising it critically: H.W., M.E., K.G., V.C., M.S.S., B.D., R.A., H.H., R.H., P.C., V.C., J.C., P.R., S.M.S. Final approval of the version to be published: H.W., M.E., K.G., V.C., M.S.S., B.D., R.A., H.H., R.H., P.C., V.C., J.C., P.R., S.M.S.

ADDITIONAL INFORMATION

Ethics approval and consent to participate The study was part of the annual requirement for the National Ocular Oncology Service Provisions set by NHS Commissioning for Quality and Innovation (CQUIN). It is retrospective in nature and a service evaluation performed in accordance with the Declaration of Helsinki. Formal ethics approval was not required.

Consent to publish Not applicable.

Data availability The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Competing interests The study was supported by the National Institute for Health Research (NIHR) Biomedical Research Centre based at Moorfields Eye Hospital NHS Foundation Trust and UCL Institute of Ophthalmology. The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health. The authors declare no competing interests.

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