



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Impact of the COVID-19 pandemic on orthognathic patients: What have we learned?

C. Wemyss^a, P. Benington^a, L. Chung^b, A. El-Angbawi^{c,d}, A. Ayoub^{a,*}

^a University of Glasgow Dental Hospital and School, 378 Sauchiehall Street, Glasgow G2 3JZ, UK

^b University Hospital Crosshouse, Kilmarnock, UK

^c Queen's Hospital, London, UK

^d University of Manchester, UK

Received 3 August 2021; accepted in revised form 9 November 2021

Available online 2 December 2021

Abstract

Due to the COVID-19 pandemic orthognathic surgery was suspended in the UK. The effect this had on patients, to date, is unknown. A multi-centre, cross-sectional survey was conducted in the UK to investigate the health-related impact on patients on the orthognathic surgery pathway, including those on the waiting list for surgery. A structured questionnaire was designed to explore the impact of the pandemic on patients whose orthognathic treatment was temporarily cancelled. Ninety-five questionnaires were returned giving a response rate of 65%. When asked if the delay due to the pandemic had caused emotional distress, 63% (51/81) agreed. During the pandemic respondents experienced more distress in relation to dental appearance (60%, 51/83), self-confidence (52% 50/83), facial appearance (53%, 44/83), and ability to eat and chew (59%, 50/83). One hundred percent of patients would have appliances fitted or their appliances adjusted during the pandemic, and 93% stated that they would attend for surgery if they were offered this during the pandemic. In conclusion, patients appear to have experienced emotional distress in relation to the delay with their orthognathic treatment. They should be given greater priority during the remobilisation of elective surgery and should have access to ongoing psychological support when delays affect their treatment. The 'surgery-first' approach may be considered for suitable patients to minimise the duration of the treatment journey.

© 2021 The British Association of Oral and Maxillofacial Surgeons. Published by Elsevier Ltd. All rights reserved.

Keywords: Orthognathic; COVID-19; Orthodontics; Questionnaire; Surgical prioritisation; Elective surgery

Introduction

In response to the COVID-19 pandemic, the National Health Service (NHS) announced a suspension to all elective surgery in March 2020.¹ This included the provision of orthognathic surgery, which is carried out for approximately 3000 patients a year.² In the United Kingdom (UK), the Federation of Surgical Specialty Associations' (FSSA) *Clinical guide to surgical prioritisation during the coronavirus pandemic* has classed orthognathic surgery as priority 4 (procedures to be performed in more than three months).³ This is unless it is being performed in relation to airway compromise that does not respond to conservative treatment and the patient is unsuitable for a tracheostomy (priority 2).

Patients who were ready for orthognathic surgery were postponed and patients who were undergoing presurgical orthodontics were put 'on hold'. In addition, there was, and still is, a significant number of patients who have been waiting for initial joint orthodontic and surgical assessment. Patients who had surgery immediately prior to lockdown were also affected. The psychological, financial, functional, and oral health impact of this delay on them is currently unknown.

Several studies since the beginning of the pandemic have investigated the impact of delays on patients waiting for different elective procedures such as cataract surgery, arthroplasty, and bariatric surgery.^{4–10} A national survey of orthodontic patients in active treatment revealed that 49% were very worried about not being followed up during the pandemic and wanted to see their orthodontist soon. Their main concern related to the treatment duration being

* Corresponding author.

E-mail address: ashraf.ayoub@glasgow.ac.uk (A. Ayoub).

extended (73%), followed by worries about ‘things that are not supposed to happen’ to their teeth.¹¹

It has been reported that 38% of orthodontic patients reported mental distress from the impact of the COVID-19 pandemic on their treatment.¹² To our knowledge, no published studies to date have involved patients undergoing combined orthodontics and orthognathic surgery.

The aim of this study, therefore, was to determine the health-related impact of the COVID-19 pandemic on patients undergoing combined orthodontic and orthognathic treatment.

Method

This was a multicentre, cross-sectional study involving orthognathic centres in Scotland and England. In consultation with several multidisciplinary teams, a questionnaire was designed to explore the impact that the suspension of orthognathic treatment has had on patients. At all units, patients were seen at a multidisciplinary clinic at which a surgeon and orthodontist were present, and they were given an information leaflet explaining the orthognathic treatment pathway.

Approval for the study was granted by the local clinical governance committees at all participating units.

Questionnaires were distributed during the third UK national lockdown, between February and May 2021. The study included patients who had been seen at a joint orthognathic clinic and were waiting for orthodontic treatment to commence, and those who were ready for orthognathic surgery.

Printed anonymised questionnaires were distributed to patients by post with a covering letter explaining the rationale for the study. Questionnaires were deemed invalid if gross deficiencies were noted.

To explore the impact of cancellations or delays in treatment, the questionnaire assessed four main domains: emotional distress, worsening of functional deficits, financial loss, and eagerness to resume treatment. A five-point Likert scale was used, and the respondents were asked to strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), or strongly agree (5) with a number of different statements.

In questions that used Likert scales, the Shapiro-Wilk test was used to test for normality and Cronbach’s alpha to test for reliability.

Results

A total of 146 patients were invited to complete the questionnaire. Ninety-five questionnaires were completed in total giving a response rate of 65%. Two questionnaires with gross deficiencies were discarded. Not all the respondents completed all the questions.

Ninety-seven percent (84/87) of respondents felt that there had been a delay in their treatment. Dental appearance (67%, 62/93) and self-confidence (66%, 61/93) were the main reasons why they had sought orthognathic treatment, followed by facial appearance (59%, 55/93) and the ability to eat and chew (60%, 56/93). Cronbach’s alpha was 0.840 for questions asking if the pandemic had caused emotional distress and 0.832 for questions asking if the reasons for seeking treatment had worsened during the pandemic. This shows excellent reliability, as values were more than 0.7.

For all Likert-style questions the Shapiro Wilk test confirmed that data were not normally distributed ($p < 0.001$). When asked if the delay due to the pandemic had caused emotional distress, 63% (51/81) agreed (Fig. 1). During the pandemic, respondents experienced more distress in relation to dental appearance (60%, 51/83), self-confidence (52%

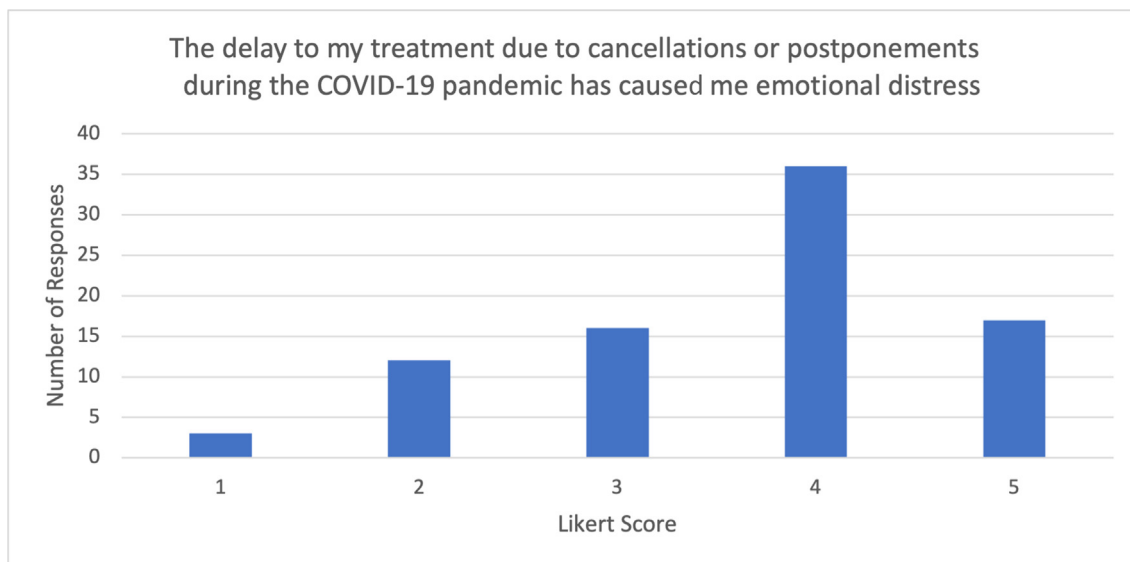


Fig. 1. The delay to my treatment due to cancellations or postponements during the COVID-19 pandemic has caused me emotional distress (1 – strongly disagree; 2 – disagree; 3 – neither agree nor disagree; 4 – agree; 5 – strongly agree).

50/83), facial appearance (53%, 44/83) and ability to eat and chew (59%, 50/83).

When asked if anything had worsened during the pandemic, 55% (45/82) agreed that their self-confidence had worsened (Fig. 2). In all other factors (dental appearance, facial appearance, ability to eat and chew, and ability to breathe and speak) less than 50% of patients agreed that they had worsened.

Of the 50 patients in pre-surgical orthodontics, 68% (34/50) had been in fixed appliances for over two years. Of the 23 waiting to start pre-surgical orthodontics, 58% (14/24) had been waiting between 12 and 18 months to have appliances fitted.

One hundred percent of patients agreed that they would have appliances fitted or adjusted during the pandemic, and 93% said they would attend for surgery if this was offered. Forty-six percent of patients (18/39) on the surgical waiting list had been waiting 12 or more months, and 31% of them had been given a date that had been cancelled at the beginning of the pandemic. The effect of the delay on their facial and dental appearance was the biggest worry for patients on the surgical waiting list, followed by the effect of prolonged orthodontics on appearance and oral health (Fig. 3). Very few were worried about contracting COVID-19 in hospital, and only six of the 42 patients on the surgical waiting list were worried about the financial effects of delay on their treatment.

Discussion

To the best of the authors' knowledge, this is the first study to assess the impact of COVID-19 on patients undergoing orthognathic treatment. The aims were to evaluate the impact of the pandemic on this group and find out if the measures put in place to manage them were considered adequate.

Patients overwhelmingly experienced more emotional distress because of the delays in their treatment. They also generally agreed that they experienced more distress with regard to self-confidence, facial appearance, dental appearance, chewing, and eating. Many of them were seen on, or at least offered, a video consultation during the pandemic. Our data, however, suggest that more needs to be done for them.

Even though most patients in this study were routinely screened by a psychologist prior to embarking on orthognathic treatment, there was no provision for psychological support during the pandemic. The offer of a video consultation was limited to patients whose date for surgery had been cancelled due to COVID-19. The purpose of these appointments was to inform the patients about the cancellation, and was not designed or intended to provide psychological support or stress management. A lesson learned is that it may have been beneficial to have provided a comprehensive, multidisciplinary video consultation in the presence of a clinical psychologist for all patients affected by delays to their treatment.

Our results suggest that continued psychological support would have been beneficial, and that this should be the ideal standard of care during a pandemic. It could even be considered for patients who have a significant wait for surgery in non-pandemic times. Prior to COVID-19, long waiting lists were commonplace within the NHS and this study highlights the effects that delays and cancellations in general have on patients waiting for orthognathic surgery.

The high level of emotional distress reported by this group of patients provides an argument that they should be given greater priority in the remobilisation of elective surgery. Most orthognathic surgery, under the Federation of Surgical Specialty Associations' (FSSA) *Clinical guide to surgical prioritisation during the coronavirus pandemic*

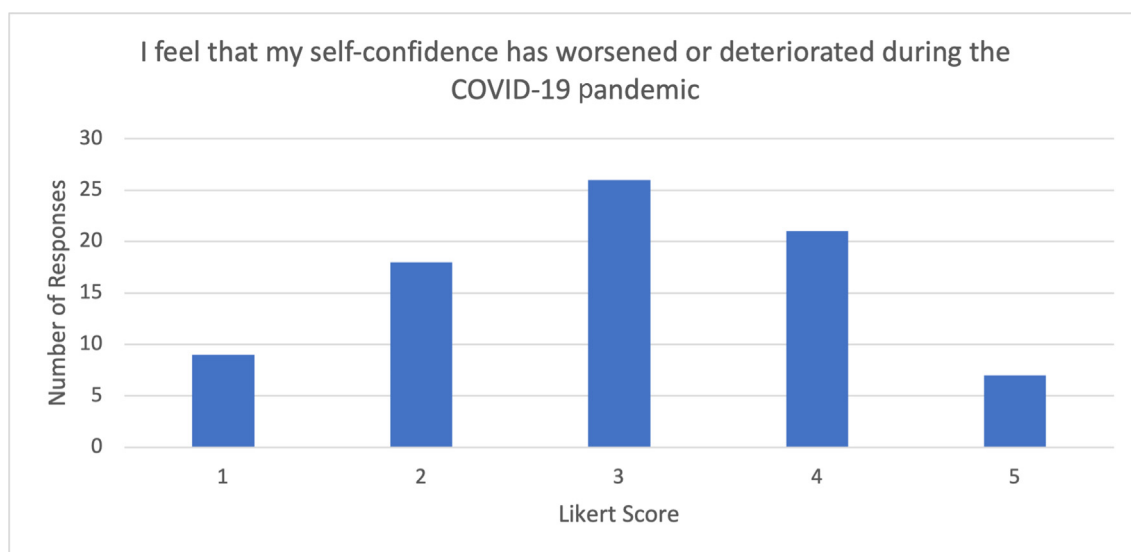


Fig. 2. I feel that my self-confidence has worsened or deteriorated during the COVID-19 pandemic (1 – strongly disagree; 2 – disagree; 3 – neither agree nor disagree; 4 – agree; 5 – strongly agree).

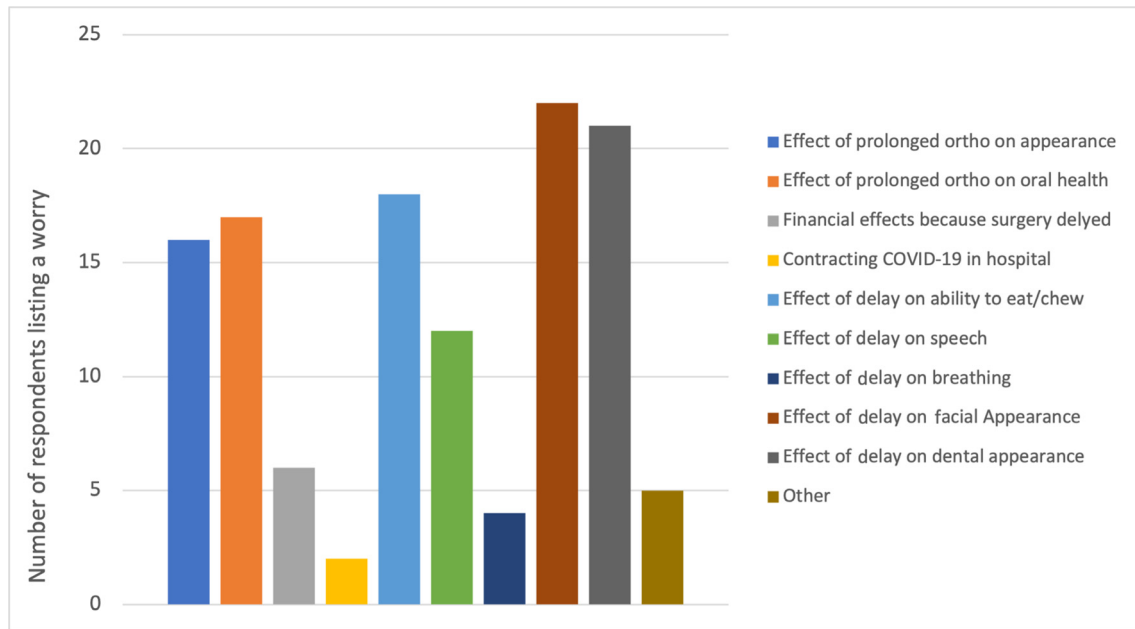


Fig. 3. Respondents' biggest worries regarding treatment. Respondents were asked to select all that worried them.

has been classed as priority 4 (procedures to be performed in more than three months).³ There are hundreds of different elective surgical procedures and perhaps more detailed sub-prioritisation should be considered for this group, due to the significant psychological impact of dentofacial deformity. Studies have shown that patients who are psychologically distressed before orthognathic surgery have a more complicated postoperative recovery.¹³ A combination of the distress caused by delays and cancellations, as well as the distress commonly seen in the preoperative phase of treatment, should be a real cause for concern.

Cataract surgery (CS) is one of the most common elective procedures in the NHS. A UK survey of patients on a waiting list for this, carried out between May and June 2020, showed that 64% of patients agreed that their eyesight was reducing their quality of life, and 70% were prepared to attend hospital within one month for surgery.⁴ Conversely, 27% of the patients were prepared to wait until cases of COVID-19 had reduced or a vaccine was available. Another cross-sectional study of a CS waiting list showed that over 80% of patients were willing to attend hospital during the pandemic for surgery.⁵ In our study, 93% of orthognathic patients were willing to attend hospital for surgery during the pandemic, and 100% were willing to have braces fitted and appliances adjusted. There was a clear desire therefore for patients to continue their treatment. Our study does not support the anecdotal misconception that patients with dentofacial deformities are likely to reverse their decision to undergo orthognathic treatment due to the circumstances of the pandemic.

Delays and long waiting lists cause distress and frustration. Combined orthodontic and orthognathic treatment is already a long journey for patients, with the British Orthodontic Society suggesting a typical treatment duration of 24 – 36 months.¹⁴ When this is further increased by

events such as a pandemic, close monitoring and counselling of patients is highly recommended. In addition, consideration should be given to modifying the treatment pathway (where possible) to reduce its duration and minimise its negative impact on patients. There is evidence to suggest that the 'surgery-first' approach significantly reduces treatment time and psychological stress when compared with the 'orthodontics-first' approach,^{15–17} which may be due to the exaggerating effect of pre-surgical orthodontic decompensation on facial disharmony and malocclusion. Delays in the treatment pathway, including lengthy surgical waiting lists, even under normal conditions, will only compound the unfavourable psychological effects of pre-surgical orthodontics. It could therefore be argued that the surgery-first approach is beneficial for suitable patients, as it bypasses this phase, reduces the wait for surgery, and simplifies the treatment journey. In addition, concern with the risks associated with 'the effect of prolonged orthodontics on my oral health' was found to be the second greatest concern of patients on the waiting list for orthognathic surgery in our study. However, we acknowledge that the surgery-first approach may not be suitable for all cases of malocclusion and skeletal deformity, and should be considered as deemed appropriate.

We acknowledge the limited NHS resources that were available to support patients during the pandemic. We would, however, like to shed some light on this particular group who unfortunately were disadvantaged and had no clear pathway to help them cope with the consequences of their dentofacial deformities and the ongoing uncertainty of when the surgical service would resume. Other specialties may have been affected in a similar way, and evaluation of the impact of COVID-19 should be considered by them separately as appropriate, but this was beyond the scope of our study.

We would like to highlight the fact that the impact of the pandemic on orthognathic patients is likely to be more profound than it is on some other groups of patients due to the fact that presurgical orthodontic treatment (dental decompensation) tends to increase facial dysmorphology. Perhaps the fact that pre-surgical orthodontics exaggerates undesirable pretreatment dentofacial features justifies a greater degree of emotional distress. This is because the treatment has made them worse, and having to cope with an even longer duration of time in that state may lead to heightened concerns compared with other patients who may be physically distressed due to a chronic condition.

In the event of a future pandemic, should all routine orthognathic surgery cases be allocated to ‘Category 4’ or, based on psychological assessment, should more consideration be given to operating on those whose quality of life is significantly affected by their dentofacial deformity? Obviously, this would depend partly on the transmissibility and severity of the infectious disease and the consequent demands on NHS facilities.

In a case series looking at 59 patients, who had orthognathic surgery between June and November 2020 in one unit in the UK, no patients had been diagnosed with COVID-19 preoperatively and none had contracted it 30 days postoperatively.¹⁸ At this time there was no approved vaccine in use, and preoperative testing, isolation, and infection-control procedures were the only precautions utilised. The masks used initially were FFP3, but these were downgraded to fluid-resistant masks in response to changes in government guidelines. Orthognathic patients tend to be younger and physiologically fitter (ASA I and II) compared with other groups of patients waiting for elective surgery. It could therefore be argued that they are a relatively safe cohort to treat during the current COVID-19 pandemic and potentially during a similar future pandemic.¹⁹

In summary, this study has highlighted several aspects relating to the orthognathic pathway that need to be addressed, and has drawn attention to the following lessons learned. Firstly, a proactive, structured support mechanism should be in place to deal with distress secondary to surgical cancellation. Secondly, the awareness of NHS authorities should be raised with respect to this group of patients and their level of distress resulting from delays to their treatment. Finally, clinicians and management should be prepared for future events that may lead to the suspension of this type of elective surgery due to pandemics or health-related crises. A psychology-based support programme should be in place and ready to implement, and a structured multidisciplinary video consultation should be provided for patients. We recommend the full engagement of staff to identify alternative solutions of working to provide orthognathic surgery amidst pandemics, rather than a reactionary attitude of closing down the service, which as an easier solution in the short term. When another pandemic strikes, we ought to be better prepared.

The authors appreciate the limitations of this study. Unfortunately, there does not appear to be a universally

accepted index to measure emotional distress in patients waiting for surgery, and the orthognathic quality of life questionnaire may not be sensitive enough for this purpose. We also agree that the sample was heterogeneous, as the cancellations due to the COVID-19 pandemic affected various groups of patients. Some were in orthodontic braces, while others were awaiting a date for surgery, with or without braces. Subdividing the sample into multiple subgroups based on their stage on the orthognathic pathway would have required a much larger sample.

The response rate to the questionnaire was satisfactory and compares favourably with previous studies. It is possible that the patients who responded may have been those experiencing the most distress due to the delays to their treatment, and this could have skewed the results. In addition, some patients may have decided not to pursue orthognathic treatment during the pandemic, and thus did not complete the questionnaire. We have no objective evidence to prove or disprove that they were more or less nervous than the respondents. In this study, affirmative statements were used with Likert scales. This could have potentially led patients to agree more readily with the statements presented.

In conclusion, patients report that they have experienced emotional distress in relation to the delay with their orthognathic treatment. The authors suggest that they could be given higher priority during the remobilisation of elective surgery. It is also recommended that patients have access to ongoing psychological support during periods of delay in their treatment, whatever the cause. In suitable patients the surgery-first approach provides a method of potentially eliminating the often unfavourable effects of presurgical orthodontics, particularly in class III cases, and may improve the patient’s treatment journey.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors would like to thank the following individuals for their help during this study: Jill White, Haris Ahmed Batley, Aileen Smith, Stephanie Nelson, Tricia Stuart, Marry Kate Kearney, Elena Pappa, and Lorna Murphy.

Ethics statement/confirmation of patients' permission

Local approval for this retrospective study was obtained. No identifiable information was included.

References

1. Scottish Government. Coronavirus (COVID – 19) update: First Minister’s speech; 30 March 2020. Available from URL: <https://>

- www.gov.scot/publications/first-minister-covid-19-update-6/ (last accessed 27 December 2021).
- British Orthodontic Society. BOS statement: orthognathic treatment. Available from URL: <https://www.bos.org.uk/News-and-Events/BOS-Statements/BOS-statement-Orthognathic-treatment> (last accessed 27 December 2021).
 - Federation of Surgical Specialty Associations (FSSA). Clinical guide to surgical prioritisation during the coronavirus pandemic. Available from URL: https://fssa.org.uk/_userfiles/pages/files/covid19/prioritisation_master_30_12_20.pdf (last accessed 27 December 2021).
 - Naderi K, Maubon L, Jameel A, et al. Attitudes to cataract surgery during the COVID-19 pandemic: a patient survey. *Eye (Lond)* 2020;**34**:2161–2162.
 - Sii SS, Chean CS, Sandland-Taylor LE, et al. Impact of COVID-19 on cataract surgery- patients' perceptions while waiting for cataract surgery and their willingness to attend hospital for cataract surgery during the easing of lockdown period. *Eye (Lond)* 2021;**35**:3156–3158.
 - Brown TS, Bedard NA, Rojas EO, et al. The effect of the COVID-19 pandemic on electively scheduled hip and knee arthroplasty patients in the United States. *J Arthroplasty* 2020;**35**:S49–S55.
 - Endstrasser F, Braito M, Linser M, et al. The negative impact of the COVID-19 lockdown on pain and physical function in patients with end-stage hip or knee osteoarthritis. *Knee Surg Sports Traumatol Arthrosc* 2020;**28**:2435–2443.
 - Sisto A, Vicinanza F, Tuccinardi D, et al. The psychological impact of COVID-19 pandemic on patients included in a bariatric surgery program. *Eat Weight Disord* 2021;**26**:1737–1747.
 - Wałędzia M, Róża ska-Wałędzia A, Pędzia M, et al. Bariatric surgery during COVID-19 pandemic from patients' point of view-the results of a national survey. *J Clin Med* 2020;**9**:1697.
 - Hotchen AJ, Khan SA, Khan MA, et al. Insights into patient preferences for elective surgery during the COVID-19 pandemic. *Bone Jt Open* 2021;**2**:261–270.
 - Shenoi SB, Deshpande S, Jatti R. Impact of COVID-19 lockdown on patients undergoing orthodontic treatment: a questionnaire study. *J Indian Orthod Soc* 2020;**54**:195–202.
 - Xiong X, Wu Y, Fang X, et al. Mental distress in orthodontic patients during the coronavirus disease 2019 pandemic. *Am J Orthod Dentofacial Orthop* 2020;**158**:824–833.
 - Hatch JP, Rugh JD, Clark GM, et al. Health-related quality of life following orthognathic surgery. *Int J Adult Orthodon Orthognath Surg* 1998;**13**:67–77.
 - British Orthodontic Society. Patient information leaflet. Orthognathic treatment. Available from URL: <https://view.publitas.com/british-orthodontic-society/orthognathicmarch2019/page/1> (last accessed 27 December 2021).
 - Huang CS, Hsu SS, Chen YR. Systematic review of the surgery-first approach in orthognathic surgery. *Biomed J* 2014;**37**:184–190.
 - Pelo S, Gasparini G, Garagiola U, et al. Surgery-first orthognathic approach vs traditional orthognathic approach: oral health-related quality of life assessed with 2 questionnaires. *Am J Orthod Dentofacial Orthop* 2017;**152**:250–254.
 - Saghafi H, Benington P, Ayoub A. Impact of orthognathic surgery on quality of life: a comparison between orthodontics-first and surgery-first approaches. *Br J Oral Maxillofac Surg* 2020;**58**:341–347.
 - Glen P, Aurora F, Thomas S, et al. Orthognathic surgery in COVID-19 times, is it safe? *Br J Oral Maxillofac Surg* 2021;**59**:490–493.
 - Bhopal SS, Bagaria J, Olabi B, et al. Children and young people remain at low risk of COVID-19 mortality. *Lancet Child Adolesc Health* 2021;**5**:e12–e13.