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# Journal Pre-proof

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## **Toward a consensus view in the management of acute facial injuries during the Covid-19 pandemic**

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### **Abstract**

In unprecedented times OMFS surgeons are faced with dilemmas over treatment priority, safety of staff, safety of patients and the most appropriate use of available resource.

Efforts should be made to provide best evidence based care, this will mean revisiting old techniques, and risk stratifying patients on a case by case basis.

Recent experience from colleagues internationally has shown that even the wealthiest health care infrastructure is at best fragile. We hope this paper will add to the debate and hopefully provide a framework to decision making in OMFS trauma care during this difficult time.

**Keywords:** COVID OMFS TRAUMA

## **Introduction**

Contemporaneous management of facial injuries has undergone steady evolution over the last 100 years. Advances in understanding of natural history and hard and soft tissue healing, together with development of osteosynthesis materials has yielded an evidence-based algorithm for treatment of facial fractures. Developments in surgical techniques have led to increased surgical exposure with improved aesthetic outcome.

Post-operative recovery with early mobilisation of mandibular and maxillary fractures have been coupled with increased predictability of surgical outcome.

Improved quantitative and qualitative outcomes have also paralleled reduced operating time and length of stay with increased utilisation of day case resources. Recent logistical innovations in the development of a major trauma centres have further enhanced and strengthened the integration of OMFS into advanced trauma management.

The recent pandemic of COVID -19 represents a considerable challenge to provision of services in terms of resources available, together with the risk of cross infection to surgical teams.

In order to plan a response to the provision of facial trauma care in the current state of emergency is important to understand the numerator, cases that require treatment , and the denominator - the total number of cases. Furthermore support to appreciate that the numerator may be influenced by both patient and cross infection factors, and the denominator may change due to trends in social behaviours.

The confusing factor is that both numerator and narrator are not fixed.

## Epidemiology

As of 10:00am on the 28th March 2020, globally there are 571,678 cases confirmed, 26,495 deaths, and 201 countries or territories affected.

There are 14,547 cases at present in the UK. The UK stands 8<sup>th</sup> in the league table with Italy topping the table with 86,498. It is widely accepted that the UK is modelling the disease progression seen in Italy, and may even have begun to exceed Italy's growth.

The WHO Director-General highlighted in his media briefing on the 27<sup>th</sup> March 20 that the chronic global shortage of personal protective equipment (PPE) is one of the most urgent threats to our collective ability to save lives

WHO's strategic objectives for this response are to:

- Interrupt human-to-human transmission including reducing secondary infections among close contacts and health care workers, preventing transmission amplification events, and preventing further international spread\*;
- Identify, isolate and care for patients early, including providing optimized care for infected patients;
- Identify and reduce transmission from the animal source;
- Address crucial unknowns regarding clinical severity, extent of transmission and infection, treatment options, and accelerate the development of diagnostics, therapeutics and vaccines;
- Communicate critical risk and event information to all communities and counter misinformation;
- Minimize social and economic impact through multisectoral partnerships.

The response from the United Kingdom government has been guarded, and a report today from the New England journal of medicine is damning (1). It is highly likely that National Health Service facilities will be paralysed by this pandemic.

Northwick Park Hospital recently declared a state of emergency with no capacity for further admissions. This is a worrying trend so early on in that the disease is still increasing. With increasing demands on the medical teams and intensive care unit, it is likely that existing operating theatre capacity will be converted to additional high dependency.

The aetiology of facial trauma is well established (2, 3), and includes assaults, road traffic accident, falls from buildings, and sports injuries. Departmental work loads are approximately predictable based on previous years experience in most hospitals.

However it is by no means clear what the effects of the government policies on social motility and their slow uptake to date will have on frequencies of interpersonal violence, and indeed the effects of self isolation on domestic violence rates will be. We therefore face an uncertain challenge where we cannot either predict the workload, or forecast the resources available for their management.

#### **Risks to staff**

There is considerable concern and anxiety from healthcare professionals who still remain unclear and untrained about personal protection. This is particularly pertinent in oral surgery and maxillofacial surgery. It is now considered that even examining patients carries a risk (4). The advice from the national associations is to take precautions for any contact

with patients, given that all potential contacts must be considered to be incubating until proven otherwise.

The safety equipment provided by the trust provides 80% protection, and the virus is present in all secretions excepting sweat. (5) The virus is also shed in serum.(6)

The risk of cross infection is magnified in the practice of facial trauma surgery in that there is a potential risk from the conjunctiva (7-9), the oral cavity, and the nose. All mid facial fractures, both central and lateral, are compound through the sinuses and therefore potentially a source of infection.

Techniques used in facial trauma surgery involve close contact with anatomical areas which harbour the virus. There are well documented cases transmission in the orbit, and from throat, with fatality. It seems intuitive, and is born out from the literature that seroconversion is influenced by duration of exposure and proximity to infective sources. (10). This is particularly relevant in complex craniofacial trauma with open sources of virus in the nasopharynx and sinuses, exposure of conjunctival surfaces, and blood.

With respect to identification of patients with infection, the signs of infection may mimic non coronavirus disease, and in addition patients may be asymptomatic at initial presentation (11, 12). Currently there is no policy for testing asymptomatic patients with surgical disease, and the existing tests do not have 100% sensitivity and specificity, so need repeating and are therefore not infallible in the very short term. (13)

With respect to the incubation period of the virus, in a recent paper there were 181 confirmed cases with identifiable exposure and symptom onset windows to estimate the incubation period of COVID-19. The median incubation period was estimated to be 5.1 days

(95% CI, 4.5 to 5.8 days), and 97.5% of those who develop symptoms did within 11.5 days (CI, 8.2 to 15.6 days) of infection. However these estimates imply that, under conservative assumptions, 101 out of every 10 000 cases (99th percentile, 482) will develop symptoms after 14 days of active monitoring or quarantine. (14) This has immense significance for mitigating the infection if delaying surgery to await resolution of infection.

It has been suggested by groups in China that there is a 3 tier approach to protecting staff, Describing protection right from entry into the clinical environment through to operating on patients and using a stepwise increase in the use of PPE as the risk increases. (21)

### **Surgical Resources available**

The widespread media presentations from the world over are chilling and suggestive of total overwhelming of medical facilities. We are naive in the United Kingdom if we feel that we will escape this scenario. Surgical treatment of complex interest involves lengthy surgery under endotracheal anaesthesia, and whilst most patients can be treated as a day case or a single overnight stay, more complex fracture patterns require more lengthy stay. We must therefore assume that there will need to be a modification of surgical management to achieve safe outcomes, as healthcare resources become compromised.

BAOMS have been proactive with strong use of the association website to publish sensible and pragmatic guidelines.

*.... And there are no more surgeons, neurologists, orthopaedic surgeons, we are only doctors who suddenly become part of a single team to face a tsunami that has overwhelmed us –*



This quote from Daniele Macchine from the BAOMS website From Italy on the 9<sup>th</sup> March is prophetic. There is a specific responsibility to ensure that essential oral and maxillofacial care continues but with a minimum burden on the NHS.

The paper conceptualises our patient cohort and makes suggestions about minimising impact –

- 1) Obligatory inpatients – this will remain our biggest challenge . These are patients with significant mandibular and facial fractures and serious space occupying infections. It is important that these patients are treated rapidly with full barrier protection, and after-care minimised.
- 2) Nonoperative patients - there are a number of conditions that can be managed either operatively or non-operatively. An example would be fractures of the mandibular condyle. We must consider ways of increasing the percentage of nonoperative cases.
- 3) day cases - more efficient, implemented as standard of care wherever possible.

Procedures under local anaesthesia could be increased to include treatments that previously were carried out under general anaesthesia.

Within London, as in Italy, Spain, Greece, and soon the rest of Europe , Stark decisions are being made in the management of patients within every specialty. This is likely to get worse.

## **The Regulatory View**

In a resource poor environment it is likely that previous established and best practice may not be possible. In the contemporaneous management of facial trauma delay in operating, together with imprecise reduction and fixation will potentially lead to functional and aesthetic compromise, the need for subsequent surgeries, and long term morbidity. This challenge is dramatic and along with concerns about maintaining safety of their surgical teams, a considerable burden for the Consultant Surgeon.

This observation has not gone un-noticed , and has parallels in every surgical and medical discipline. This has resulted in a joint statement from :-

General Chiropractic Council

General Dental Council

General Medical Council

General Optical Council

General Osteopathic Council

General Pharmaceutical Council

Health and Care Professions Council

Nursing and Midwifery Council

Pharmaceutical Society of Northern Ireland

Scottish Social Services Council

Social Work England

*'We encourage health and care professionals, working in partnership with each other and people using services, to use their professional judgement to assess risk to deliver safe care*

*informed by any relevant guidance and the values and principles set out in their professional standards.*

*We recognise that in highly challenging circumstances, professionals may need to depart from established procedures in order to care for patients and people using health and social care services.’ (20)*

## **With respect to the management of craniofacial trauma**

The aim of any strategy in the current environment is to provide the best care for our patients, with the resources available, whilst protecting our teams. The care that can be provided is influenced by the cross infection risk together with the resources available.

## **Tele Communication**

The principle of reducing staff members in face-to-face contact, and reducing the size of duty teams is an obvious principle.

Good communication of all aspects of individual cases, together with appropriate radiology can provide sound diagnosis and treatment planning which can be authorised from a remote site. This is recognised by the regulatory bodies.

## **EMERGENCY MANAGEMENT**

It is essential that any personnel involved in procedures generating aerosols, or at risk of contamination by bodily fluids be equipped by full barrier precautions.

Emergency management to will continue according to established and evidence based protocols, with threat to life in terms of airway, arrest of mid facial haemorrhage and

Threats to vision mitigated by established techniques (15, 16).

Mandibular and maxillary fractures temporised by the use of interdental wiring. (bridle wire), and soft tissue wounds closed with ligation of bleeding points.

### **Ongoing Management**

Ultimately the management of each fracture pattern must be considered on its own merits, aligned with the condition of the patient, and resources available. It is important to understand that most patients will be COVID negative and therefore can be managed in exactly the normal, best evidenced practice – subject to a specific and individualised risk assessment. It, however, must be realised that even in COVID negative patients, operative time, or logistic support may not be available and treatments, or even no treatment may be all that is possible.

The types of fracture pattern can be considered surgically, and prognostically, and both of these will influence decision making, treatment strategies, and outcome. Should non-contemporaneous techniques or supervised neglect be instituted, then outcomes can be considered in terms of reduction from what would normally be expected with normal practice and with the subsequent surgical secondary reconstructive option. It must be acknowledged that the patient is unlikely to achieve a perfect outcome from a significant injury with delayed repair. This must be communicated and recorded in the notes.

### **Stratification of Facial Fracture patterns**

We propose a hierarchical classification of facial skeletal injuries based on severity, and consideration of fracture patterns which have a particular uncertain outcome after secondary revision. Some secondary deformities have a good prognosis – using only slight departures from acute surgery ( anterior wall frontal sinus), some have a moderately

increased risk of poor outcome ( large combined floor and medial wall), whilst Naso orbit ethmoid fractures have a very much more uncertain prognosis if managed late.

**Group 1- Severe fracture pattern with predictable morbidity and complex secondary reconstruction**

- Naso-orbito-ethmoid
- Craniofacial with anterior skull base compromise - CSF leak, pneumocephalus
- White eye blow out fracture
- Significantly segmented zygomatic body fracture
- Displaced / segmented Maxillary fractures , palatal split
- Comminuted mandibular fractures with or without orocutaneous fistulae
- Facial Nerve transection

These are all injuries with significant potential morbidity if treatment is delayed. The restoration of precise bone architecture of NOE, or significant segmentation of the zygomatic body results in secondary bone and soft tissue changes which are extremely difficult to mitigate secondarily, and segmental maxillary fractures with a palatal split requires considerable orthodontic and surgical skill with a long treatment pathway.

**Group 2 - Moderate fracture pattern, predictable morbidity with unpredictable secondary reconstruction, reduced outcome**

- Orbital Fractures medial wall and large floor +/- diplopia
- Significantly displaced Tripod fracture Zygoma multiple articulations
- Isolated Zygomatic Arch Fractures
- Displaced Le Fort 1 Maxillary Fracture without segmentation

- Mandibular fractures with displacement
- Displaced condylar neck fracture
- Dentoalveolar fractures
- Grossly displaced nasal fractures

These are injuries that have a secondary reconstructive option, but it involves significant additional surgical access for example an isolated zygomatic arch fracture requiring a coronal flap, or where secondary repair can predictably result in reduced outcome for example a significant floor and medial wall orbital fracture.

### **Group 3 - Minor injury with predictable secondary reconstruction**

- Anterior table frontal sinus fracture
- Mildly displaced Tripod fracture - 1 articulation
- Orbital fracture small, one surface, no diplopia
- Mildly displaced closed mandibular fracture

These are groups of fractures that can be treated conservatively with reasonable likelihood of healing e.g. a mildly displaced fracture, or an anterior wall frontal sinus fracture which requires the same surgical approach, but with a mesh repair or alloplastic bone. In this group a secondary repair will predictably produce an excellent result.

### **COVID-19 Status**

This is difficult to assess in the absence of physical symptoms, although the patient may be aware of a close contact who has subsequently seroconverted. The incubation and natural history of the infection are variable, and open to discussion.

As testing becomes more available then it may be possible to defer cases to recover from infection and reduce the risk.

Risk can be quantified into –

- Low risk – a patient who has recovered from infection or who has been isolated for 7 days without symptoms
- Medium risk – a patient who has been exposed to a known coronavirus patient within 7 days
- High risk – a patient known to have the disease either by clinical, radiological, or diagnostic serology

Ultimately the surgeon and anaesthetist will undertake a measured clinical decision based on clinical presentation as to the risk, modified by the fracture pattern, and operative procedure required.

Use of protective equipment is, of course mandatory.

### **Hospital Resources**

#### **Scenario A – Best Case Scenario – full access**

This implies resource allocation sufficient for contemporaneous practice. Near-normal staffing levels, adequate surgical materials.

The current status in most hospitals as this paper is written has gone beyond this. Once the epidemic has peaked, and the numbers of infected patients reduce then services will be restored.

**Scenario B- Mid case Scenario – reduced capacity**

This implies reduced access to operating theatres with a reduction in staffing levels. In this scenario not only is there reduced specialty access, but there is also competition between specialties to provide emergency and urgent care for general surgical problems. At this point there has to be transparent discussion between Consultant level doctors to prioritise patients according to need, which will be influenced by the both diagnoses and in addition by the time that the patients have been waiting.



**Scenario C – worse case scenario**

This implies no access to operating theatres with poor staff levels. At this point treatment across the whole surgical directorate is compromised, and suitable management strategies become less satisfactory and more basic.

**Planning Surgical Protocols**

The consideration of surgical approach and procedures depends on a dynamic relationship between all of the factors described above. This will be modified according to the infective status of the patient. It is important to appreciate the significant risk of contamination from the conjunctiva and the sinuses, and steps must be considered to avoid prolonged surgery to reduce potential viral load.

With decompensation of the hospital surgical resources then controlled simplification of surgical access and fixation must follow. The patient must be informed of the reasons for the surgical planning, and the possible secondary corrective work. Late secondary correction can produce acceptable results, but is labour intensive and some results sub optimal.(17)

It is highly likely that some conditions will be treated in a very historic manner with extensive use of intermaxillary fixation (18) which if used correctly can give reasonable outcomes.

Soft tissue repair – both in traumatic wounds, and in surgically approached should be resorbable to minimise follow up.

This is

It must also be appreciated that the modern maxillofacial surgeon is a well trained and valuable asset who may also be utilised by medical and surgical colleagues, as was evident in the previous London Terrorist outrage.(19)

This staggering toll on human life will continue to drive our instinct for survival and, through which we will no doubt adapt and become more imaginative and resourceful clinicians.

**Ethics statement/confirmation of patient permission**

N/A

**Conflict of Interest**

No conflicts of interest

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Links

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