Analysis of Penetrating Neck Injuries (PNIs) at a South London Trauma Centre before and after the first national lockdown.

Gabriela Di Scenza[1], Katrina Mason[2], and Georgios Oikonomou[3]

[1]Poole Hospital
[2]Evelina London Children's Healthcare
[3]St George's University Hospitals NHS Foundation Trust

November 5, 2021

Abstract

*A 28-month retrospective review from February 2019 to April 2021 of penetrating neck injuries (PNIs) at our trauma centre revealed a 48% (n=25 to n=37) increase in PNIs 'post-lockdown' (lockdown date = 23rd March 2020). *The aetiology of PNI changed over time, with an increase in the proportion of Deliberate Self Harm' (DSH) cases from 1/3 to 2/3rds of case (n=9 to n=25), an overall 177.8% increase 'post-lockdown'. An increase in mortality was also seen with no deaths 'pre-lockdown', and 3 deaths 'post-lockdown'. *'Accidental Injuries' (AI) increased from 4% to 10% of cases (n=1 to n=4) post lockdown, with 'grievous bodily harm (GBH) reducing from half to 1/5th of all cases (n=13 to n=8), and 'domestic violence' from 8% of cases to no cases post lockdown (DV) 'post lockdown'. *'Pre-lockdown' 10% of DSH patients (n=1) were noted to have a prior mental health diagnosis or psychiatric care, 'post-lockdown' this increased to 61.5% (n=16) of DSH patients. *Data from our tertiary trauma centre in London has shown a change in aetiology, psychiatric co-morbidity and number of PNIs pre and post lockdown.

Analysis of Penetrating Neck Injuries (PNIs) at a South London Trauma Centre before and after the first national lockdown

Key points:

- A 28-month retrospective review from February 2019 to April 2021 of penetrating neck injuries (PNIs) at our trauma centre revealed a 48% (n=25 to n=37) increase in PNIs 'post-lockdown' (lockdown date = 23rd March 2020).
- The aetiology of PNI changed over time, with an increase in the proportion of Deliberate Self Harm' (DSH) cases from 1/3 to 2/3rds of case (n=9 to n=25), an overall 177.8% increase 'post-lockdown'. An increase in mortality was also seen with no deaths 'pre-lockdown', and 3 deaths 'post-lockdown'.
- 'Accidental Injuries' (AI) increased from 4% to 10% of cases (n=1 to n=4) post lockdown, with 'grievous bodily harm (GBH) reducing from half to 1/5th of all cases (n=13 to n=8), and 'domestic violence' from 8% of cases to no cases (DV) 'post lockdown'.
- 'Pre-lockdown' 10% of DSH patients (n=1) were noted to have a prior mental health diagnosis or psychiatric care, 'post-lockdown' this increased to 61.5% (n=16) of DSH patients.
- Data from our tertiary trauma centre in London has shown a change in aetiology, psychiatric co-morbidity and number of PNIs pre and post lockdown.

Introduction:

Penetrating Neck Injuries (PNIs) are defined as a trauma which breaches the platysma (1). They are considered an uncommon but serious presentation which may require immediate treatment due to potential

adverse outcomes (2). Generally, the treatment for PNIs can be classified into immediate surgical treatment, delayed surgical treatment and conservative (most commonly closure under local anaesthetic)(3).

Whilst globally GBH and gunshot wounds account for the majority of PNIs, Deliberate Self Harm (DSH) and other accidents are responsible for a significant proportion in the United Kingdom (4). St George's University Hospital is a major London trauma centre covering a wide geographical population of 3.5 million and receives a large number of trauma patients through its Emergency Department (5).

1.1 Objectives:

It was speculated at the beginning of the pandemic that lockdown and its resultant effects: uncertainty, social isolation, and loss of control, would have a negative impact upon people's mental and physical wellbeing (6). We sought to compare aetiology and differences in presentation of PNI before and after the pandemic in our London trauma centre.

Methods:

Ethical considerations:

We performed a retrospective audit of all PNIs admitted between February 2019 and April 2021. The audit was registered and approved by the trust's audit department, audit no AUD100092.

2.2 Participants and Data

A hospital database search was undertaken searching for all admissions with ICD-10 diagnostic criteria for all types of PNI. A further hand search of digital department handover records was reviewed to identify any missing patients. We recorded data on patient demographics, mechanism of injury, management, and outcomes. 'Immediate surgery' was classified as any surgery being undertaken upon immediate transfer from the Emergency Department to the operating theatre. We also recorded data on 'hard signs' of PNIs, haemodynamic stability, use of fine nasal endoscopy (FNE), operative management, imaging used, and surgical specialities involved (2). As no national guidelines currently exist for the management of PNIs specifically, NICE guidelines on Major Trauma and internal guidelines from our centre were used to audit care received (3,7).

The UK national lockdown date of 23rd March 2020 was used to divide patients into 'pre-lockdown' or 'post-lockdown', with an equal amount of 14 months of data collected pre and post lockdown.

3. Results:

A total of 62 PNIs were identified from February 2019 to April 2021. The total incidence of recorded PNIs increased by 48.0% post lockdown (n=25 pre-lockdown to n=37 post-lockdown), (see Table 1).

In total, 83.9% of patients were male (n=52) whilst 16.1% were female (n=10). The mean age for males was 38.8 (range 16 to 89) for females 38.0 (range 7 to 62). There was a modest increase in females being admitted with PNI from pre to post lockdown (n=3 to n=7 an increase of 133.3%).

In terms of classifying the injuries, the most common zone was Zone II (43.5% n=27), followed by those occurring in Zone I (17.7% n=11), Zones II and III simultaneously (13.6% n=9) and Zones I + II (11.3% n=7), (see Table 3) (2). Overall, incidences of injuries in each zone remained stable with the exception of Zone 1 which increased (n=3 to n=8 a 166.7% increase).

The most common implement used to inflict injury was a knife (62.9% n=39) followed by bottle (8.1%, n=5) and gun (6.4%, n=4) and razor blade (3.2%, n=2). From pre lockdown to post lockdown the use of knives to inflict PNIs increased (n=15 to n=24 60.0% increase), the use of all other implements remained stable.

Most PNIs were investigated with a CT scan (75.8%, n=47), Chest X-ray (CXRs) (n=1) and a number received a CT scan and Chest X-ray (17.7% n=11). Furthermore, a significant proportion of patients underwent a CTA/CT with contrast (67.7%, n=42) or using FNE (29.0%, n=18). Furthermore, many did not have hard signs recorded (61.3%, n=38). In those who did, the most common were airway compromise

(16.1%, n=10), hypovolaemia (12.9%, n=8), arterial bleeding (11.3%, n=7) and surgical emphysema (11.3%, n=7). There were broadly no increases in patients experiencing hard signs but a substantial increase in patients with no hard signs (n=13 to n=25, 92.3% increase), (see Table 4).

When attempting to prevent blood loss, the use of platelets and haemostatic agents such as tranexamic acid was frequent (46.8%, n=29) whilst major haemorrhage protocol ('code red') was activated in a minority, (25.8%, n=16) of cases. There was no change in this before and after the onset of the pandemic, (see Table 4).

In terms of definitive management, the most common form of management was delayed exploration and closure under general anaesthetic (59.7%, n=37), followed by conservative treatment (25.8% n=16) whilst a minority received immediate surgical management (14.5%, n=9). The most common procedures recorded were exploration under general anaesthetic (62.9%, n=39) followed by closure of a neck wound (38.7%, n=24) and panendoscopy (30.6%, n=19). Other procedures recorded in small numbers include: panendoscopy, washout, foreign body removal as well as pharyngoscopy and laryngoscopy. Procedure numbers broadly remained stable from the pre to the post lockdown period except for delayed exploration and closure under general anaesthetic increasing from the pre to post lockdown (n=13 to n=24 84.6% increase).

There were increases in the number of patients undergoing surgical management from the pre to the post pandemic period including: Washout (133.3% increase), Pharyngoscopy (100% increase), Exploration (41.2% increase) Panendoscopy (37.5% increase), (see Table 2).

The most common surgical speciality involved in the treatment of PNIs alongside Otolaryngology was Plastics (32.5% n=20) followed by Vascular (22.6%, n=14) and Cardiothoracic (17.7%, n=11). There was an increase in patients being consulted by Plastics from pre to post pandemic period (n=6 to n=14 133.3% increase) but numbers of patients being seen by other specialities remained stable.

An increase in mortality was noted. Before the pandemic, no deaths were recorded due to PNI, but from March 2020 to April 2021, post-lockdown there were 3 deaths.

4 Discussion:

4.1 Comparison to previous audit and other trauma centres

When evaluating the care people received, increasing proportions of PNIs were investigated with imaging as outlined in NICE Guidelines (3,7). We compared this treatment with a previous 2009-2011 audit at our trust and found it was most noticeable when comparing patients who received a CT scan (75.8% February 2019 to April 2021 compared to 58.3% December 2009 to May 2011) and CTA/CT with contrast (67.7% February 2019 to April 2021 compared to 8.3 % December 2009 to May 2011).

A rise in DSH pre and post pandemic was noted. A previous 2009-2011 audit of PNIs in our trust revealed 48.0% were attributed to DSH (3), we noted a similar rate in our 2019/2021 audit with 40.7% of PNIs pre-lockdown, however this increased to 66.6% of PNIs post-lockdown, an increase of 177.8% (see Table 1).

The other major cause of PNI, GBH had decreased during lockdown. 40% of total PNIs were attributed to GBH in 2009-2011, compared to 21.6% of PNIs noted after the first lockdown in our audit (3). This corresponds to trends in penetrating trauma at other centres including King's College Hospital they noted 25% of PNIs were due to PNI compared to 11% in 2019 (8). In 2020, DSH represented 27% of total traumas compared to 11% in 2019 whilst GBH dropped to 63% in 2020 compared to 89% in 2019 (8).

4.2 Clinical Applicability

Before the pandemic only one patient with a pre-existing psychiatric condition was identified compared to 16 after. Subsequently, there was increased demand for inpatient mental health treatment post-injury reflecting an additional impact on mental health services experienced post-lockdown.

Our centre experienced an increase in the number of PNIs post-lockdown and an increase in the number of surgical procedures on PNIs (see Table 2 and Table 3) representing a rise in demand for trauma and surgical

services. This contrasts with the experience of other centres such as King's College London which recorded a decrease in penetrating trauma (a decrease of 35%) (8).

Our centre experienced an increase in the proportion of DSHs post lockdown. DSH is a concerning feature as it often precedes suicide attempts (9). People with pre-existing mental illness are classified as being at increased risk due to social distancing measures, (9,10). The long-term effects of the COVID-19 pandemic on mental health are unknown, but studies of previous pandemics found that for people with prior psychiatric diagnoses the negative effects of isolation could be observed at least 4-6 months after quarantine (11).

Our centre saw a 16-fold increase in the proportion of patients with pre-existing mental health disorder with DSH post lock-down perhaps reflective of this increase in risk to mental health and DSH posed by the COVID-19 pandemic.

4.3 Limitations:

It would be beneficial to compare our data with results from more trauma centres nationally to substantiate conclusions about the increase in DSH. Similarly, it would be wise to conduct a longitudinal study post-pandemic to see if this is a continuing trend.

5 Conclusion:

Post-lockdown, the characteristics of patients presenting with PNIs has changed at our London trauma centre. We have experienced an increase in number of PNIs and a transformation from a cohort containing multiple aetiologies to most patients presenting with DSH. This alongside an increase in the proportion of patients with prior mental health conditions perhaps reflects the psychological impact the COVID-19 pandemic has had on mental health placing an increase in demand on both trauma, surgical and mental health services. We hope this single-centre audit of PNIs pre and post lockdown provides valuable insight for ENT surgeons working in trauma centres, highlighting the importance of multidisciplinary and sensitive management of these complex patients

Conflict of Interest:

Authors have no conflict of interest

Word Count: 1585 (not including key points)

Bibliography

1. Sperry JL, Moore EE, Coimbra R, Croce M, Davis JW, Karmy-Jones R, et al. Western Trauma Association critical decisions in trauma: penetrating neck trauma. J Trauma Acute Care Surg. 2013 Dec;75(6):936–40.

2. Nowicki JL, Stew B, Ooi E. Penetrating neck injuries: A guide to evaluation and managementx. Ann R Coll Surg Engl. 2018;100(1):6–11.

3. Siau RTK, Moore A, Ahmed T, Lee MSW, Tostevin P. Management of penetrating neck injuries at a London trauma centre. Eur Arch Oto-Rhino-Laryngology. 2013;270(7):2123–8.

4. Burgess CA, Dale OT, Almeyda R, Corbridge RJ. An evidence based review of the assessment and management of penetrating neck trauma. Clin Otolaryngol Off J ENT-UK ; Off J Netherlands Soc Oto-Rhino-Laryngology Cerv-fac Surg. 2012 Feb;37(1):44–52.

5. St George's NHS Foundation Trust. Media Enquiries - St George's University Hospitals NHS Foundation Trust [Internet]. [cited 2021 Jul 11]. Available from: https://www.stgeorges.nhs.uk/news/media-enquiries/

6. Usher K, Durkin J, Bhullar N. The COVID-19 pandemic and mental health impacts. Int J Ment Health Nurs. 2020;29(3):315–8.

7. Nice. Major trauma : assessment and initial management. 2018;(August):197–201. Available from: www.nice.org.uk

8. Olding J, Zisman S, Olding C, Fan K. Penetrating trauma during a global pandemic: Changing patterns in interpersonal violence, self-harm and domestic violence in the Covid-19 outbreak. Surgeon. 2021 Feb;19(1):e9–13.

9. Kapur N, Clements C, Appleby L, Hawton K, Steeg S, Waters K, et al. Effects of the COVID-19 pandemic on self-harm. The Lancet Psychiatry [Internet]. 2021;8(2):e4. Available from: http://dx.doi.org/10.1016/S2215-0366(20)30528-9

10. Pierce M, Hope H, Ford T, Hatch S, Hotopf M, John A, et al. Mental health before and during the COVID-19 pandemic: a longitudinal probability sample survey of the UK population. The Lancet Psychiatry [Internet]. 2020;7(10):883–92. Available from: http://dx.doi.org/10.1016/S2215-0366(20)30308-4

11. Jeong H, Yim H, Song Y, Ki M, Min J, Cho J, et al. Mental health status of people isolated due to Middle East Respiratory Syndrome. Epidemiology and health [revista en Internet] 2016 [acceso 14 de febrero de 2021]; 38(1): 1-7. 2016;1–7. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5177805/

Mechanism of Injury	Total number of patients (Feb 2019 to April 2021)	Pre-lockdown No. & % of patients	Post-lockdown No. & % of patients	*% Change from pre to post lockdown (+/-)*
Deliberate Self Injury (DSH)	*34*	9 (36%)	*25 (67%)*	+177.8%
Grievous Bodily Harm (GBH)	21	13 (52%)	8 (21%)	-38.5%
Accidental Injury (AI)	5	1 (4%)	*4 (10%)*	+300%
Domestic Violence (DV)	2	2 (8%)	0 (0%)	-100%
Total	62	25	37	+48%

Table 1. Mechanism of Injury of all patients

Type of procedure	No. of patients with PNI who underwent procedure pre-lockdown	No. of patients with PNI who underwent procedure post-lockdown	Change +/- % of PNI patients who underwent procedure pre- to post-lockdown	Total % of PNI patients who underwent procedure
Exploration (under local or general anaesthetic)	17	25	+47.0	67.7
Closure of neck wound	9	15	+66.6	38.7
Panendoscopy	8	11	+37.5	30.6
Washout	3	7	+133.3	16.1
Foreign body removal	2	4	+100.0	9.7
Pharyngoscopy	1	3	+200.0	6.5
Laryngoscopy	1	2	+100.0	4.8

Table 2. The procedures undergone by patients

Zone of Injury	No. of patients Pre-lockdown	No. of patients post-lockdown	Total patients
I	3	8	11
II	13	14	27
III	1	2	3
I + II	3	4	7
II + III	4	5	9
I + II + III	1	1	2
Not Documented	0	3	3

Table 3. Zones of Injury

Hard sign	No. of patients before lockdown	No. of patients after lockdown	Total % patient experiencing hard sign
Airway compromise	6	4	16.1
Hypovolaemia	4	4	12.9
Arterial bleeding	5	2	11.3
Surgical emphysema	4	3	11.3
Hoarse voice	0	3	4.8
Expanding haematoma	1	0	1.6
Unable to swallow	0	1	1.6
Air escape	0	1	1.6
No hard signs	13	25	61.3

Table 4. Hard signs prevalence