





Effects of COVID-19 lockdown measures on emergency plastic and reconstructive surgery presentations

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Abstract

Background: In Australia, the COVID-19 pandemic has caused severe social disruptions, including restrictions to the movement of people. Healthcare centres around the world have seen changes in the nature of injuries acquired during the COVID-19 pandemic; we therefore hypothesize that social isolation measures have changed the pattern of plastic and reconstructive surgery presentations.

Methods: A prospective cohort study was designed comparing patient presentations during the enforced COVID-19 lockdown to two previous periods. All emergency referrals requiring operative intervention by the plastic and reconstructive surgery unit of our institution were included. Patient demographics, place and mechanism of injury, drug and alcohol involvement, delays to presentation, length of admission and complication rates were collected.

Results: Demographics and complication rates were similar across all groups. A 31.8% reduction in total number of emergency cases was seen during the lockdown period. Increase in do-it-yourself injuries ($P = 0.001$), bicycle injuries ($P = 0.001$) and injuries acquired via substance abuse ($P = 0.041$) was observed. Head and neck injuries, mostly due to animal bites and falls, were also more prevalent compared to the same period the previous year ($P = 0.007$). As expected, over 80% of plastic surgery operations during the COVID-19 period were due to injuries acquired at home, a significant increase compared to previous periods.

Conclusion: Despite changes in the pattern of presentations requiring plastic and reconstructive emergency surgery, traumatic injuries continued to occur during the pandemic. Thus, planning will be essential to ensure resource allocation for emergency procedures is sustained as second and third waves of COVID-19 cases emerge worldwide.

Introduction

The COVID-19 health crisis was formally declared a pandemic by the World Health Organization on 11 March 2020. In Australia, COVID-19 threatened to cause severe disruption to health care, prompting the government to restrict the movement of people and thus limit disease transmission. Over 20 000 COVID-19 cases have been documented in the state of Victoria at the time of writing.¹ Lockdown measures included prohibiting people from leaving home unless for essential chores (food, work or exercise), restricting the size of gatherings, cancelling sporting and leisure activities as well as significant reductions in schooling and retail

activities.² Within the healthcare setting, elective operations were restricted to exclusively high priority cases in an attempt to preserve resources.

Frankston Hospital is the major tertiary healthcare institution servicing the Mornington Peninsula area of Victoria with over 450 inpatient beds. The scope of emergency referrals to plastic and reconstructive surgery units is varied and includes soft tissue and hand trauma, subcutaneous infection, minor burns and facial trauma amongst others. Work- and sport-related injuries often contribute to a significant proportion of the emergency workload. In addition, animal bites, motor vehicle accidents, home injuries, bicycle

accidents and interpersonal violence constitute other mechanisms of trauma leading to plastic surgery referrals.

Multiple centres around the world have seen changes in the nature of trauma presentations during the COVID-19 pandemic.^{3–5} Largely, a decrease in plastic surgery presentations and therefore surgical procedures for all conditions have been described. Studies from Brazil and Italy indicated decreased numbers of both facial and hand trauma and a significant reduction in the number of surgeries performed.^{6,7} These findings were similar to other studies from European countries.^{8,9} Contrary to other descriptions, another study demonstrated significant increase in the number of hand and wrist injuries requiring operative management.¹⁰ Interestingly, none of the cited studies detailed the adjustment in presentation patterns or correlations with the behavioural changes resulting from the imposed lockdown measures.

We hypothesized that significant changes in daily activities, including changes to transport, social gatherings, sport, domestic recreation and work may have influenced emergency plastic and reconstructive surgery admissions. In addition, we theorized that, due to fear regarding contracting COVID-19 through interactions with health care, patients may have delayed presenting to hospital, as described in Italy.¹¹ To investigate these hypotheses, a prospective analysis was performed to compare emergency plastic surgery presentations between the first 2 months of lockdown measures in Victoria to recent unrestricted periods.

Methods

Data pertaining to plastic and reconstructive surgery emergency presentations were prospectively collected during the first 2 months of the enforced COVID-19 lockdown and compared to two previous periods. The first comparison period was the corresponding dates in the preceding year, from 22 March 2019 to 17 May 2019 (pre-COVID-2019 group). The second comparison group was the period immediately preceding the lockdown from 27 January 2020 to 22 March 2020 (pre-COVID-2020 group). Finally, the third cohort represented presentations during the first 2 months of the COVID-19 lockdown period from 22 March 2020 to 17 May 2020 (COVID-19 group).

The lockdown period that defined the COVID-19 group was defined as the period following the implementation of ‘stage 3’ measures imposed by the Australian Government. This involved four approved reasons to leave the house: for food and supplies, for exercise, for medical care and for essential work and education. Other changes to the delivery of care we observed were similar to those described by Benítez *et al.*, including restricting inpatient visiting, size reduction to unit teams and the utilization of teleconference for staff communication and unit meetings.¹² Personal protective equipment utilization adhered to the World Health Organization and state government guidelines and patients were preoperatively screened for COVID-19.

Inclusion and exclusion criteria

All emergency referrals requiring operative intervention by the plastic and reconstructive surgery unit of our institution were

included. Patients with post-operative complications following elective procedures who subsequently presented to the emergency department were excluded from this study. Data were comprehensively collected through retrospective medical record review. Patient demographics included age, sex, patient occupation and hand dominance. Location of injury was categorized into home, work, community, sport and road. Further data points collected included mechanisms of injury, drug and alcohol involvement, whether the injury was due to self-harm, time to presentation following injury, anatomical structures injured, length of admission and complication rate.

Statistical analysis was performed using Stata (Stata Statistical Software: Release 16; StataCorp LLC, College Station, TX, USA). Continuous data were tested for normality using the Shapiro–Wilks test and all found to be non-normal, thus data from different groups were compared using the Kruskal–Wallis test. Categorical or interval data were compared using either a chi-squared test or a Fisher’s exact test. In all cases, a *P*-value of less than 0.05 was considered significant. Ethics approval for this study was obtained from the Peninsula Health Human Research Ethics Committee.

Results

A total of 617 patients received emergency treatment by the plastic and reconstructive surgery unit during the three periods investigated. This included 161 patients within the COVID-19 group, 236 patients in the pre-COVID-2019 group and 220 in the pre-COVID-2020 group. Thus, a 31.8% decrease in plastic surgery emergency presentations requiring an operation was observed in the COVID-19 lockdown group compared to the same period the previous year (pre-COVID-2019). Demographics including patients age, sex and occupation were similar between the three groups (Table 1).

No statistically significant difference was observed in the median length of stay (*P* = 0.22) or the median delay in presentation to hospital (*P* = 0.58). The complication rates decreased from 7.6% in pre-COVID-2019 to 6.4% and 3.1% in the respective pre-COVID-2020 and COVID-19 time periods but this change was not statistically different (*P* = 0.16). When compared, the two control groups pre-COVID-2019 and pre-COVID-2020 were similar regarding demographics, complication rates, length of stay, mechanism of injury and location of injury, thus demonstrating the usual workload seen at our service (Tables 1,2).

Hand injuries were the most common cause for a plastic surgery operation across all groups with no disparity in incidence (pre-COVID-2019 versus pre-COVID-2020 versus COVID-19 61.5% versus 60.5% versus 57%; *P* = 0.68). There was a statistically significant change in the proportion of injuries to the head and neck with 16.8% in the COVID-19 lockdown group compared to 15.5% and 7.6% for the pre-COVID-2020 and -2019 groups, respectively (*P* = 0.01). In contrast, the proportion of injuries to the leg, foot, arm and thorax was not significantly different between the three periods. The most prevalent mechanisms of head and neck injury in the COVID-19 lockdown period leading to plastic surgery operations were animal bites (30%) and falls (41%). The number of hand fractures requiring surgical intervention during the COVID-19

Table 1 Demographics

	Pre-COVID-2019 group	Pre-COVID-2020 group	COVID-19 group	<i>P</i> -value
Number of patients	236	220	161	—
Age, median years (IQR)	35 (34)	36 (31)	38 (31)	0.68
Gender				0.34
Male, <i>n</i> (%)	178 (75)	157 (71)	111 (69)	
Female, <i>n</i> (%)	58 (25)	63 (29)	50 (31)	
Occupation, <i>n</i> (%)				0.51
Unemployed/retired	40 (24)	33 (21)	12 (15)	
Manual	93 (57)	92 (58)	51 (62)	
Non-manual	31 (19)	34 (21)	19 (23)	
Right handedness, <i>n</i> (%)	112 (82)	102 (86)	90 (92)	0.07
Inpatient stay, median days (IQR)	1 (1)	1 (1)	1 (1)	0.22
Presentation delay, median days (IQR)	0 (1)	0 (1)	0 (0)	0.58
Complication rate (%)	7.6	6.4	3.1	0.16

P-values are derived from Kruskal–Wallis or Fisher’s exact test.

IQR, interquartile range; *n*, number of patients.

Table 2 Mechanisms of injury requiring plastic and reconstructive surgery emergency operations

Mechanism	Pre-COVID-2019 group, <i>n</i> (%)	Pre-COVID-2020 group, <i>n</i> (%)	COVID-19 group, <i>n</i> (%)	<i>P</i> -value
Do-it-yourself injury	15 (6.4)	10 (4.6)	27 (16.8)	0.00
Animal bite	30 (12.7)	27 (12.3)	19 (11.8)	1.00
Assault	11 (4.7)	8 (3.6)	9 (5.6)	0.65
Self-harm	6 (2.5)	2 (0.9)	2 (1.2)	0.37
Bicycle injury	2 (0.9)	0 (0.0)	7 (4.4)	0.00
Blunt, punching injury	27 (11.5)	20 (9.1)	2 (1.2)	0.00
Motor vehicle accident	5 (2.1)	5 (2.3)	1 (0.6)	0.51
Crush injury	23 (9.8)	24 (10.9)	13 (8.1)	0.52
Drug-related injury	6 (2.6)	6 (2.8)	12 (7.5)	0.04
Alcohol-related injury	16 (6.8)	19 (8.8)	4 (2.5)	0.03

P-values are derived from Kruskal–Wallis or Fisher’s exact test.

n, number of patients.

period was less than half than that in the same months pre-COVID-2019; however, the changes did not reach statistical significance ($P = 0.114$).

A significant increase in ‘do-it-yourself’ (DIY) injuries that required plastic surgery was identified with 16.8% of patients having injuries related to DIY in the COVID-19 lockdown group compared to 6.4% and 4.6% of cases in the pre-COVID-2019 and pre-COVID-2020 groups, respectively ($P = 0.001$; Table 2). Despite low numbers, bicycle-related injuries requiring plastic surgery operations also had a statistically significant increase in frequency compared to the control groups ($P = 0.001$). Meanwhile, emergency presentations caused by punching or blunt trauma were statistically significantly lower during the COVID-19 period ($P < 0.001$). Injuries sustained while under the influence of alcohol were significantly less common in the COVID-19 lockdown group ($P = 0.032$), whereas illicit drug-related injuries had a statistically significant increase in frequency ($P = 0.041$). Frequency of presentations caused by animal bites, assaults, self-harm, motor vehicle accidents and crush injuries had similar incidence across all groups (Table 2).

In terms of injured anatomical structures, rates of tendon and muscle injuries, facial fractures, nailbed injuries, nerve injuries and simple soft tissue injuries were similar across the three groups. The most prevalent location to sustain an injury leading to a plastic

surgery operation during the COVID-19 period was the patient’s home. At 80%, this represented a statistically significant increase compared to both the pre-COVID-2019 and -2020 groups at 55% and 57%, respectively ($P < 0.001$). There was a uniform decrease in emergency presentations with injuries sustained at work, sport, community and on the road during the COVID-19 lockdown period compared to both controls ($P < 0.001$).

Discussion

The COVID-19 pandemic has resulted in significant changes to the pattern of injuries leading to plastic and reconstructive surgery emergency presentations in our institution. Restrictions to activities prone to cause injuries, such as contact sport and manual labour, and reduced access to the emergency department are both possible explanations to the 31.8% reduction in operative cases. Furthermore, fear of contracting the disease by presenting to a potentially crowded emergency department could have also served as a barrier, as previously noted by another study.¹³ Centres in the USA, Italy and Spain experienced a similar reduction in plastic surgery trauma admissions.^{6,8,9} In contrast, a UK study showed no changes in the volume of traumatic injuries requiring plastic surgery operations during the lockdown period, although they did utilize the

emergency department of their institution to perform cases that would conventionally have been treated by emergency staff.¹⁴

Changes to emergency presentations during the COVID-19 pandemic have also been described in emergency general surgery. An Australian study showed a 6% reduction in all-cause emergency general surgery admissions.¹⁵ Conversely, their operation numbers for acute conditions actually increased by 12%. Another study reported a decrease of over 50% in the number of patients presenting to emergency with diverticulitis.¹⁶ Alarming, this finding was paired with a significant increase in severity at presentation and need for operative management. Furthermore, multiple studies have reported increased severity in patients presenting with appendicitis also leading to high rates of operative intervention.^{17–19}

Despite the observed reduction in emergency presentations during the COVID-19 lockdown, this study highlights the importance of continuing resource allocation to emergency presentations requiring surgery. Although not directly recording operative length, we found that the rates of several complex injury patterns requiring plastic surgery remained unchanged. Rates of peripheral tendon and nerve injuries as well as facial and hand fractures were all statistically similar within the three groups. This was in keeping with Diamond *et al.*, who reported ongoing emergency hand surgery numbers during the pandemic, including the need for an average 115 min of daily operating time and the allocation of eight theatre staff.¹⁰ On a positive note, key performance indicators such as length of inpatient stay and complication rates were not significantly affected by COVID-19 at our institution. This was despite the inherent fatigue that the pandemic has caused to healthcare staff and the potential impact of wearing personal protective equipment on surgical performance as previously described.²⁰

As expected, home-related injuries formed the majority of plastic surgery emergency workload during the lockdown period at Peninsula Health. Similar findings have been reported in South Australia, where a 20% increase in injuries occurring at home was observed.²¹ A surge in home-related paediatric trauma have also been described in other centres during the pandemic.²² Accidental home-related injuries are a significant public health issue around the world, responsible for large proportion of emergency department presentation. Falls, laceration and burns have been reported to generate the greatest cost burden in home-related accidents, all of which often require plastic and reconstructive surgery input.²³

Our study showed a statistically significant increase in DIY injuries during the COVID-19 restriction period, with some injuries causing severe functional impairment. The results of our study are supported by data released by the Monash University Accident Research Centre, which identified a 77% increase in the numbers of DIY injuries when compared to the same period last year.²⁴ DIY refers to any task performed to make, mend or maintain that is accomplished by oneself rather than hiring a professional or tradesperson. This type of activity has frequently been a source of injury requiring hospital presentation and often surgical intervention. Typical motivations for engaging in DIY activities include pride and satisfaction in completing chores, as well as a means of keeping fit and occupied.²⁵ Pertinent to COVID-19, unemployment, social isolation and decrease in exercise options have all been reported to drive people to perform tasks around the house that they

usually would not.^{26,27} Furthermore, the fear of contracting coronavirus from hiring professionals to perform maintenance work may have led to more people undertaking DIY activities.

Presentations with head and neck injuries were more common in the COVID-19 lockdown compared to the previous year in this study, with the majority sustained by animal bites and falls at home. A recent study reported higher rates of animal-related injuries in children during COVID-19 pandemic, attributed the findings to school and workplace closures leading to more time spent at home and thus greater exposure to domestic animals.²⁸ Increase in falls requiring emergency presentations has also been described by others.²⁹ Inability to leave home can pose a substantial detriment on physical and mental well-being especially in the elderly population. A systematic review by Sepúlveda-Loyola *et al.* showed substantially lower levels of physical activity in older adults during periods where lockdown measures were in place, including reduced attendance to physical activity programmes.³⁰ This generalized deconditioning of the elderly is likely to be an important contributor to the higher rates of falls resulting in head injuries observed during the pandemic.

The strengths of this study include the comparison of the COVID-19 lockdown cohort into two separate control groups, thus reducing the effect of seasonal variation in the patterns of patient presentation. Moreover, data of over 600 emergency cases requiring plastic and reconstructive surgery operations were analysed making it a robust sample size. Furthermore, patient demographics between groups did not significantly differ. Limitations of the study include the retrospective nature of the comparison groups. In addition, our tertiary centre also does not receive patients suffering from major multi-trauma and burns, potentially generating sampling bias. Only cases needing operative intervention were included, and although small number of plastic surgery admissions do not require surgical intervention, excluding data from non-operative presentations could have resulted in sampling bias.

Conclusion

This is the first Australian study to describe the impact of the coronavirus pandemic and lockdown measures on the pattern of plastic surgery emergency presentations. Despite total number of cases decreasing following government imposed stay-at-home orders, trauma occurring in the home, especially DIY injuries, substantially increased in frequency. Animal bites and falls resulting in head and neck trauma also increased, likely secondary to increased exposure to domestic pets and deconditioning caused by lack of exercise.

The COVID-19 lockdown has presented unique challenges to healthcare provision in Australia and the rest of the world. Allocation of resources such as staffing, operating theatre allocations, equipment ordering, outpatient clinic planning and education have all been affected. This study shows that injuries requiring emergency plastic and reconstructive surgery continued to occur at significant volume during COVID-19-related lockdown period. Thus, planning will be essential to ensure resource allocation for emergency procedures is sustained as second and third waves of COVID-19 cases emerge worldwide.

Author Contributions

Leonardo Cordova: Data curation; investigation; writing-original draft. **Nicholas Savage:** Data curation; writing-original draft. **Rachna Ram:** Conceptualization; data curation. **Lisa Ellis:** Data curation; writing-review and editing. **Vicky Tobin:** Formal analysis; writing-review and editing. **Warren Rozen:** Conceptualization; writing-review and editing. **Marc Seifman:** Conceptualization; writing-review and editing.

Conflicts of interest

None declared.

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