

IMPACT OF COVID-19 PANDEMIC ON ACUTE ACROMIOCLAVICULAR DISLOCATION EPIDEMIOLOGY AND POST-OPERATIVE OUTCOMES

Gregorio Secci ¹, Allegra Sorgente ¹, Andrea Guarino ¹, Piero Franco ², Efisio Bazzucchi ¹, Raffele Tucci ¹, Matteo Innocenti ², Roberto Civinini ²

1. Department of Shoulder and Elbow, A.O.U. Careggi CTO, Florence, Italy

2. Department of General Orthopedic, University of Florence, A.O.U. Careggi CTO, Florence, Italy

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ABSTRACT

The purpose of the study was to evaluate how AC dislocation epidemiology and postoperative outcomes have changed during COVID-19 pandemic, in order to take advantage of this peculiar period to better understand risk- and prognostic-factors. A retrospective analysis was performed between the patients surgically treated for acute AC dislocation between March and December of either the 2017, 2018, and 2020. Patients' characteristics and postoperative outcome was compared. Comparing the one-year Constant-Murley and DASH scores we found that COVID-19 period presented significant worst results. We found a significant decrease of rate of sport injury in COVID-19 period, and a significant increase of rate of road injury. The most common mechanisms were motorcycle accidents (23,81%) and cases of bicycle accidents (23,81%). No differences were found between age, sex, and failure rate. COVID-19 outbreak changed the epidemiology and the outcome of AC dislocation showing a strong correlation to two-wheel vehicle road accident, and a worst outcome of the patient treated during outbreak.

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1. Introduction

At the beginning of 2020, there was a global spread of a new type of Corona virus, called Sars-CoV-2, characterized for high mortality. On 11 March 2020, COVID-19 (CoronavirusVirus Disease 19) was declared a pandemic by the World Health Organization [1]; so the daily life of millions of people changed drastically. Initially, the only health measures were social distancing, isolation, and quarantine [2]. Meeting places such as restaurants, sport centers and cinemas were closed to prevent the virus's spreading. This outbreak also radically changed other crucial daily activities: schools were closed, and the instruction was made through remote learning, working from home was encouraged, sport activity was forbidden, and road mobility reduced. Hospitals' work regimes have been focused mainly on COVID-19. This strongly changed the orthopedics activity: fractures reduced, and elective surgeries were postponed [3].

Acromioclavicular (AC) joint dislocation represents 8% of all the shoulder dislocations [4] and sporting activity is the most common cause [5-7]. It is classified by Rockwood classification with six types relatively to the grade of soft tissue disruption. For high grade dislocation the treatment choice is surgery [5].

We hypothesized that the epidemiology and the postoperative outcomes of AC dislocation have changed during the period of the COVID-19 pandemic.

No data have been published yet analyzing the influence of the Sars-CoV2 pandemic on Acromioclavicular dislocation epidemiology and outcome.

The objective of this study was to examine how the COVID-19 pandemic impacted the characteristics and the outcome of the AC joint dislocation by comparing them with the same period without an outbreak, in order to take advantage of this peculiar period to better understand risk- and prognostic-factors.

* Corresponding author: Gregorio Secci, gregorio.secci@unifi.it

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2. Material and methods

Study Design

A retrospective comparative analysis was performed on 58 patients admitted to the Shoulder and Elbow Surgery Unit of our tertiary care hospital due to an acute AC joint dislocation between March and December of either 2017, 2018, or 2020. The time interval from March to December 2020 was considered as COVID 19 pandemic period (Group C). The same time intervals in 2017 and 2018 were considered as non-pandemic periods (2017 as Group A, 2018 as Group B). 2019 period was excluded from the study because most of the patients haven't had the chance to complete rehabilitation before the start of the COVID-19 outbreak.

Inclusion criteria were patient with grade more or equal to III acute AC joint. Excluded from the study were all the patients (x=16) with a diagnosis of local and systemic illness other than the AC dislocation (SLAP lesion, rotator cuff tear, Bankart lesion, glenohumeral arthritis, hemiplegia, Parkinson disease, Alzheimer disease etc.) or chronic dislocation (AC dislocation treated more than 1 month after the trauma).

At the moment of admission to the hospital of the patients during COVID period, a Sars-CoV2 molecular PCR (polymerase chain reaction) test on nasopharyngeal swab was performed to rule out the Sars-CoV2 infection. If a patient resulted positive, the surgical procedure was postponed once he/she was negativized. So, no patient was operated on while positive to Sars-CoV2.

At the admission, we collected patient data as medical history, clinical and radiological data. For all dislocation, we defined four groups: sport injury, road injury, domestic injury, work-related injury. Furthermore, the accident mechanism was specified as the type of sport in sport injury (soccer, rugby, cycling, skiing, other) or the vehicle used in the road injury (car, motorcycle, bicycle). Bicycle injuries were divided into sport and road injuries based on the aim of the ride.

All the patients were treated surgically by a specialized shoulder surgeon using Suspensory Button technique with ZipTight fixation system (Zimmer Biomet, Warsaw, Indiana, USA). The patients treated with any other surgical technique were excluded from the study.

Postoperatively, every patient had to wear a universal shoulder sling for a month, allowing them to remove it during the main meals of the day to actively move hand, wrist, and elbow. After the first month postoperatively, the patients were allowed to passively move the shoulder as pendulum movement or assisted elevation on scapulo-humeral plane. Active movements were allowed after six weeks postoperatively. During this phase, a physiotherapist assisted the patient in isotonic and isometric muscle strengthening. Traumas and heavy strains were forbidden until three months postoperatively.

The follow-up was structured with seriate clinical and radiological exams at one, three and twelve months postoperatively. During the one year of follow-up, functional scores as Constant-Murley score and DASH score were collected, as well Antero-posterior and Zanca x-ray views were taken. To evaluate the maintained reduction, the AC joint dislocation ratio was measured in the one-year Zanca view x-ray: a ratio greater than 0.5 was considered as loss of reduction, according to Marcheggiani Muccioli et al. [8].

This study was performed in line with the principles of the Declaration of Helsinki. Written informed consent was obtained from all individual participants, and the study was approved by the ethics review committee of our institution.

Statistical analysis

To perform the statistical analysis, SPSS statistics software version 21.0 for Windows (Microsoft Corporation, Redmond, Washington) was used. The normality of the groups was evaluated with the Shapiro-Wilk test due to the small case number of each group. We employed Mann-Whitney U test to compare continuous variables for abnormal distribution, and Fisher exact test to compare the categorical variables. P values < 0.05 were considered statistically significant.

3. Results

The three groups consisted of: 13 patients for group A, 15 for group B and 14 for group C, so overall 42 patients fulfilled the criteria. The average age was respectively 45.23 (range 26-56), 49.20 (range 26-75) and 44.50 (range 18-68). Comparing the age groups, we appreciated no statistical difference between the groups (C vs A p=0.981, C vs B p=0.621) (Table 1). The average Constant-Murley Score was 98.30 ± 2.29 (SD), 96.93 ± 3.01 and 87.93 ± 8.44 for the three groups, respectively. The average DASH score was 0.5 ± 0.54 , 0.44 ± 0.62 and 2.14 ± 4.85 , respectively. Comparing the one-year Constant-Murley and DASH scores, we found that COVID-19 presented significantly worse results (CMS: C vs A p=0.001, C vs B p=0.001; DASH: C vs A p=0.001, C vs B p=0.011), while the two Pre-COVID-19 groups were comparable (CMS: B vs A p=0.185; DASH: B vs A p=0.821) (Table 1).

	2020	2018	2017	p vs2018	p vs2017
CMS	87.93±8.44	96.93±3.01	98.31±2.29	*0.001	*0.001
DASH	2.14±4.85	0.44±0.62	0.5±0.54	*0.011	*0.001
Age	44.5±16.07	49.2±16.18	45.23±11.57	0.621	0.981
Female	1	1	1	1	1

Table 1. (*=significant value) comparison between outcome and clinic scores

Analyzing the implants' failures with loss of reduction as endpoint we found three cases: one case in group A, two cases in group B, zero cases in group C. No statistical difference was observed between the groups about loss of reduction (C vs A p=0.481, C vs B p= 0.483.). Analyzing the etiologic mechanism (Figure 1) we found two cases of car accidents (4.76% of the overall 42 patient), three cases of soccer injuries (7.14%), three cases of rugby injuries (7.14%), three cases of domestic accidents (7.14%), three cases of work-related injuries (7.14%), four cases of skiing injuries (9.52%), four cases of miscellaneous (9.52% such as horse riding injuries, flag-weaver activity etc.), ten cases of motorcycle accidents (23.81%) and ten cases of bicycle accidents (23.81%, 5 cases in the sport group, 5 cases in the road injury group).

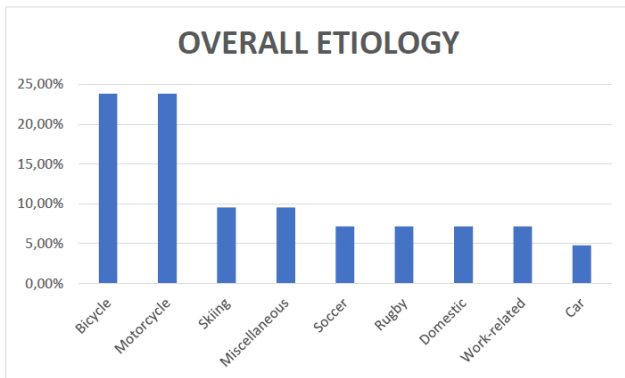


Figure 1. Two-wheel vehicle injuries as the most frequent mechanism of AC dislocation

We found a statistically significant decrease of rate of sport injury in COVID-19 period (C vs A $p=0.003$, C vs B $p=0.005$), on the other hand there was a statistically significant increase of rate of road injury in this period (C vs A $p=0.021$, C vs B $p=0.009$) (Figure 2).

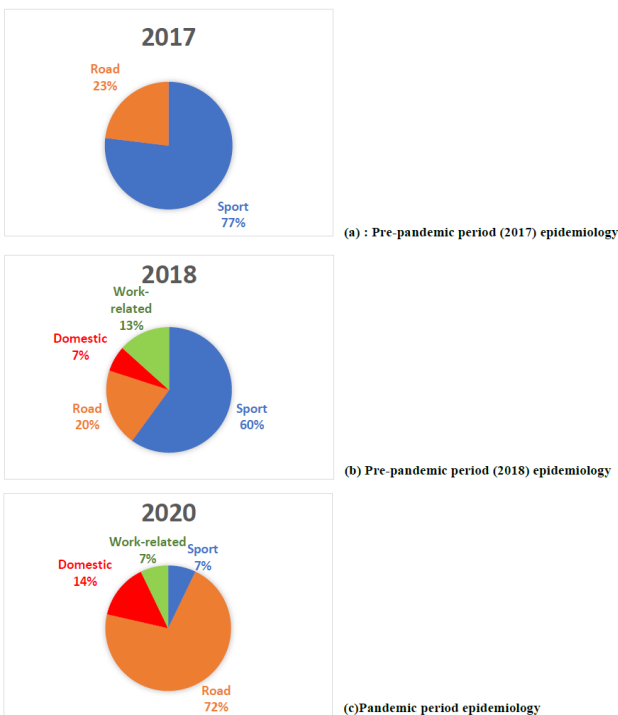


Figure 2. Descriptive analysis of mechanism of trauma during the three years of observation

No difference was found comparing work related injury ratio (C vs A $p=1$, C vs B $p=1$) and domestic injury ratio (C vs A $p=0.481$, C vs B $p=0.598$) (Table 2).

Finally, no difference was found between males and females (C vs A $p=1$, C vs B $p=1$) (Table 1).

Etiology	2020	2018	2017	p vs2018	p vs2017
Sport	1	9	10	<0.01	<0.01
Road	10	3	3	<0.01	<0.05
Domestic	2	1	0	0.06	0.48
Work	1	2	0	1	1

Table 2. Univariate Analysis of mechanism of trauma during the three years of observation

4. Discussion

This study was designed to reflect on how the COVID-19 influenced the epidemiology and the outcomes of acromioclavicular dislocation. This disease is a common shoulder injury that every orthopedic surgeon must assess in his activity, but nowadays there is no consensus about the correct treatment indications [9], and the gold standard surgical technique [5]. COVID-19 pandemic has caused a singular situation: personal freedom restrictions were imposed on a global scale also with consequences on orthopedic and traumatology activity [10]. According to a systematic review by Kumar Jain et al., during COVID-19 period there was a global significant reduction in the load of orthopedic patients [11]. It could be easily explained by the imposed outbreak, the sport ban and all the other limitations that characterized this period. Analyzing our data there wasn't any decrease in number of acromioclavicular dislocations. Probably, it is related to the fact that Florence Hospital is a tertiary care hospital, the biggest in the region, which continued trauma surgical activity also during COVID-19 outbreak, as opposed to other hospitals where orthopedics were redeployed to other departments [12]. Therefore, most of the patients affected by acromioclavicular dislocations were centralized to our hospital.

We have noticed a change in the etiology of the disease: before COVID-19 period, the main cause of acromioclavicular disease was sport, according to the literature [5-7]. During the outbreak people couldn't play any sports, so the main cause became road accidents. Most of these patients crashed on their way to their workplace. Nordin et al. reported that road accidents have a higher risk of high-grade dislocations compared to other mechanisms [13]. On the other hand, domestic accidents increased during COVID-19 period due to the obligation to stay home imposed on the population. This difference didn't appear statistically significant probably due to the limited number of cases (Table 3).

Analyzing the mechanism of injury, we reported overall ten cases of bicycle accident and ten cases of motorcycle accidents (Table 2). *Riding a two-wheeled vehicle was found to be responsible for nearly half of these dislocations (47.62%)* because it exposes the principal mechanism of injury as a direct trauma onto the AC joint with adducted upper limb, according to the literature [14, 15]. Indeed, Goldstein et al. analyzed the bicycle related shoulder injury, and the AC dislocation results in second position of incidence with 22% [16].

The current study documented significantly lower Constant-Murley and DASH scores in patients operated in 2020 during COVID-19 outbreak (Table 1). Analyzing the x-rays, we didn't find any reason regarding the implant positioning.

All the procedures were made by highly specialized surgeons that follow standardized techniques. A possible explanation could be found in the post-operative physiotherapy: in 2020, unessential activity were suspended, and people limited the contact with healthcare establishments and related workers as much as possible because of fear of Sars-CoV2 infection. This might have resulted in poor assisted rehabilitation with incomplete range of motion recovery. It refers to a Cote et al.[17] study where it is highlighted that *proper post-operative rehabilitation plays an important role in the management of these injuries*. For an adequate rehabilitation protocol, the patient must be assisted by a physical therapist to avoid high AC joint stress movements as intra-rotation behind the back, cross-body adduction, and end-range forward elevation [17], and trained in specific exercises, for example to strengthen the scapular stabilizers [18]. Furthermore, patient's positioning, erect or supine, during post-operative rehabilitation does not affect the outcome as noted by Ibrahim et al. [19].

On the other hand, although no statistical difference was found, we noticed a lower ratio of surgical failure and loss of reduction at one year x-ray control. Probably it was because during COVID-19 period people could no longer do high risk activities, so the risk of traumatic recurrence was reduced.

This study has several limitations: the retrospective design of the study, the limited number of the cohorts and the abnormal COVID-19 scenario where most other hospitals stopped orthopedic surgery activity with the centralization of the large part of the traumas.

5. Conclusions

The outbreak imposed in Italy during 2020 due to Sars-CoV2 changed the epidemiology and the outcome of AC joint dislocation. This study deepens AC joint dislocation epidemiology showing its strong correlation to two-wheel vehicle road accidents. Furthermore, we noted a worse outcome of the patient treated during outbreak, probably due to a poor post-operative rehabilitation. We regard assisted physiotherapy as crucial for patient recovery.

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