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# **Significant decrease of facial cellulitis admissions during COVID-19 lockdown in France: a multicentric comparative study**

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## **Abstract**

During the 2020 coronavirus pandemic, a lockdown was imposed in France during the first wave. An apparent decrease in incidence of cellulitis of odontogenic origin was noticed then. This study aimed to compare the incidence of cellulitis during this extraordinary period with the same period in 2018 and 2019, based on retrospective multicentric data. All maxillofacial surgery departments in French public hospitals were contacted. Responders were asked to include all patients admitted for the surgical drainage of a head and neck abscess of odontogenic origin during the first 2020 lockdown period, and in a similar time frame in 2018 and 2019 (control group), based on screening the French diagnostic and therapeutic classification of medical acts. We report a 44% significant nationwide decrease in the incidence of admissions for cellulitis. There was 187 patients in 2020 for 334 and 333 patients in 2018/2019 respectively. The reasons to explain this finding are hypothetical (organizational reasons leading to earlier management, patients' fear to seek for medical management, usual excess in surgical indications or concomitant decrease of non-steroidal anti-inflammatory drugs delivery). Whatever the explanation, it would be of great interest to find it out in order to improve the prevention of cellulitis.

**198 words**

**Keywords:** Lockdown; Non-steroidal anti-inflammatory drugs; COVID-19; Cellulitis; Tooth infection; Dental infection.

**Running title:** Facial cellulitis admissions decrease during COVID-19 pandemic

## Introduction

The coronavirus disease 2019 (COVID-19) pandemic due to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been challenging healthcare systems and medical communities worldwide from the beginning of 2020 [1].

In France, many measures have been taken by the health authorities in order to slow down the rapid surge of the pandemic. A first lockdown of the French population has been set up from the 17th of March to the 11th of May 2020. During this shutdown, many restrictions to everyday life were set up. People were only allowed to leave their homes in limited situations: work (when work from home was not possible), medical appointment, compelling family motive, essential food purchases and walking not more than 1 km away from home. Other restrictive measures were also taken, among which: closure of all elementary and middle schools, high-schools and universities, bars, hotels and restaurants, prohibition of any gathering over than 20 individuals and prohibition of religious ceremonies.

Moreover, the whole medical activity had redirected towards the management of emergencies. In the field of oral and/or maxillofacial (OMF) surgery, departments only admitted facial trauma, craniofacial infections and malignant conditions. Dentists were also instructed to manage exclusively emergency dental cares.

Major changes in the spectrum of usual OMF emergency admissions have been observed during this lockdown [2-4]. Significant decreases in the overall number of general and facial trauma during COVID-19 lockdown have been already reported [2-5]. In France, a significant decrease in maxillofacial trauma during this period has been observed in comparison to equivalent periods in 2018 and 2019 with an average overall

reduction of 65.5% [6]. Such changes in the incidence of medical emergencies have also been observed in many other fields, such as in cardiology (*e.g.* myocardial infarctions) or neurology (*e.g.* stroke) [7,8].

Surprisingly, a major decrease of the incidence of head and neck cellulitis of odontogenic origin has also been observed in previous monocentric studies by several maxillofacial surgery departments across the world during the lockdown period. This fact has even already been reported by some of them [9-11]. At first sight, it seems that no influence on the development of infections, such as a cellulitis, is to be expected from the shutdown measures. Assessing the incidence of cervicofacial cellulitis during the lockdown period in France, using retrospective multicenter data, appeared therefore as a relevant clinical question.

The aim of the present study was to compare the incidence of head and neck cellulitis of odontogenic origin, requiring drainage surgery, during the COVID-19 lockdown period in France, based on controlled multicentric retrospective data.

## **1 Patients and methods**

### ***1.1 Design of the study***

A retrospective multicentric observational comparative study was designed. All the departments of oral surgery and/or maxillofacial surgery currently involved in the medical care of head and neck cellulitis in French public hospitals have been invited to participate to the study. Invitations to participate to the survey were sent by e-mails addressed to the heads of each department: one invitation e-mail followed by at least 4 reminder e-mails. The first e-mails have been sent at the end of the lockdown period, on

the 15<sup>th</sup> of May 2020. The data collection period was planned to last at least four months and/or the necessary time to get data from at least 15 OMF departments.

### ***1.2 Population of the study***

All patients, without age restrictions, who had undergone surgical - intra-oral or extra-oral - drainage of a head and neck abscess of odontogenic origin during the core of the lockdown period in France (*i.e.*, between the 9<sup>th</sup> of March and the 30<sup>th</sup> of April 2020) could be included. Patients admitted for similar reasons during the same period in 2018 and 2019 constituted the control group, in order to control for seasonal variations reported for this condition [12]. There were no exclusion criteria.

### ***1.3 Inclusion procedure according to usual medical coding***

To ensure the reproducibility of the inclusion criteria, the French national diagnostic and therapeutic classification ('Classification Commune des Actes Médicaux', CCAM) was used. In France, it is mandatory to attribute at least one diagnostic and one treatment code according to CCAM to every procedure.

For patients to be included into the study, we considered diagnostic codes K122 (oral phlegmon or abscess) and/or L032 (facial phlegmon). Therapeutic codes were LCJA 002 (drainage of a collection of the masticatory muscles region, by intraoral approach and by facial approach), LCJA 003 (drainage of a perimaxillary and/or perimandibular collection by intraoral approach), LCJA 004 (drainage of a collection of the masticatory muscles region, by intraoral approach), QAJA 003 (drainage of a cervicofacial and/or mediastinal diffused phlegmon, by cervicotomy approach), QZJA 011 (drainage of a deep collection of skin and/or soft tissues, by direct approach), HAJA 002 (drainage of



a floor of the mouth collection, by intraoral approach) and/or HAJD 004 (drainage of a collection of the base of the tongue). Collected data were therefore the number of managed patients and their age.

#### ***1.4 Ethical approval***

The present study was approved by the local ethical committee of Angers University Hospital (Protocol agreement number 2020/55) and by the French data regulatory authority, the ‘Commission Nationale de l’Informatique et des Libertés’ (CNIL) with the registration number ar20-0057v1. The study was conducted in accordance with the institutional guidelines of the French Ethical Committee and with the 1964 Helsinki declaration and its later amendments. Since data were anonymous, no patient consent was needed for this study according to institutional guidelines.

#### ***1.5 Statistical analysis***

Statistical analysis was performed using Systat statistical software v13 (Systat Software, Inc., San José, CA, USA). All data were expressed as mean  $\pm$  standard deviation. Difference between the years 2018/2019 and 2020 was assessed using a Student paired *t*-test. Differences were considered significant for  $p < 0.05$ .

## **2 Results**

### ***2.1 Participants***

Forty oral and/or maxillofacial surgery departments were finally contacted, from all

over France. A total of 18 departments took part into the study. The overall responses rate was 45 % (95% CI: 29.58 – 60.41). The data collection period lasted for about seven months (from the 15<sup>th</sup> May to the 30<sup>th</sup> December 2020).

Included centers were university hospitals for 15 departments (83%) and general hospitals for 3 departments (17%). University hospital centers were: Angers, Besançon, Bordeaux, Caen, Clermont-Ferrand, Grenoble, Lille, Marseille, Montpellier, Nantes, Paris (Necker – Enfants Malades hospital), Saint-Denis-de-la-Réunion, Strasbourg, Toulouse and Tours. General hospitals were Aix-en-Provence, La-Rochelle and La-Roche-sur-Yon.

## ***2.2 Overall epidemiological results (Table 1 and Figure 1)***

A significant difference was found between the number of patients managed in 2020 *vs.* the number of patients of the years 2018 and 2019 ( $p = 0.036$ ). The total number of patients who have been managed for cellulitis was 187 patients in 2020. Yet the expected number of patients (mean of the number of patients of the same period in 2018 and 2019) was  $333 \pm 0.70$  patients. In consequence, the average theoretical decline in the total number of patients was 43.85% (95% CI: 38.51 – 49.17) during the COVID-19 lockdown period in 2020. A trend for a younger mean age at admission was also noticed ( $36.24 \pm 21.48$  years in the 2020 group *vs.*  $38.83 \pm 21.63$  years in the 2018/2019 group) but this difference was not statistically significant ( $p = 0.078$ ).

### ***2.3 Epidemiological results by hospital (Figure 2)***

Only 2/18 OMF departments witnessed an increase in the incidence of cellulitis (Nantes and Caen). In 8/18 OMF departments, a > 50% decline in the incidence of cellulitis was observed (Table 2 and Fig. 3).

## **3 Discussion**

In the present study, a surprising significant 44% decrease in the incidence of hospitals admissions for collected head and neck cellulitis of odontogenic origin has been highlighted during the COVID-19 lockdown period in France in March and April 2020. To our knowledge, this fact has not been previously described in a multicentric study in the literature. However, a 30% decrease of the number of patients consulting for cellulitis or dental abscess has been reported during the COVID-19 epidemic in January in an observational monocentric study in China but the authors did not seek for a statistical difference [11]. The reasons to explain such findings are hypothetical. However, a few hypotheses can be raised. These hypotheses could also be associated and the multifactorial explanation seems the more likely to us.

This decrease could be explained by many factors related to the lockdown measures. One hypothesis could be that many patients feared being admitted in hospitals that were known to manage COVID-19 patients and thus avoided seeking medical care despite symptoms of cellulitis. This hypothesis has been raised to explain epidemiological changes in the incidence of other medical emergencies, such as stroke, myocardial

infarction, minor traumas or pediatric emergencies [5,7,8,13,14]. A significant decrease in the overall number of cancer diagnoses even seems to have occurred during that period for the same reasons [15]. In the same vein, a decrease in the number of patients diagnosed with acute appendicitis has been observed with a concomitant increase in the number of complicated acute appendicitis after the application of COVID-19 related restrictions in US [16]. Non operative management (*i.e.* antibiotics) of acute appendicitis seem to have been widely preferred during the pandemic with good results and even new recommendations for the management of the disease [17-19].

According to us, this surmise cannot explain alone the decreased incidence of admitted cellulitis. Indeed it is known that the natural history of cellulitis may lead to life-threatening complications in many cases even in case of proper medical management and even more so in case of absence of medical care [20,21]. In addition, no death due to severe untreated cellulitis has been reported, to our knowledge, during the same period. On the other hand, we cannot reject the hypothesis of certain excess in usual surgical indications of cellulitis drainage. The hypothesis of good outcomes in cellulitis healing obtained with non-operative management, as described in acute appendicitis, could thus be relevant.

Furthermore, organizational factors may partly explain our results. The activity of dentists had been refocused on dental emergencies exclusively, during lockdown. With this pause in all the routine dental care, it is likely that more patients (than usual) needing emergency dental management were treated by dentists. This probably allowed patients with dental infections to receive earlier adapted antibiotics than usual. It can therefore be hypothesized that a higher number of patients than usual was cured this

way and did not need any hospital admission. This fact is supported by the literature: an increased proportion of infections has been reported during the epidemic in patients admitted for dental emergencies, relative to other dental emergencies such as dental traumatism [11]. The decrease in the incidence of dental trauma, linked to the general decrease in facial trauma reported during that period, may also explain the decrease in the incidence of cellulitis since dental traumas are known to be a cause of cellulitis [6,12].

A last hypothesis could be evoked. In March 2020, whether concomitant non-steroidal anti-inflammatory drugs (NSAID) treatment could be harmful or safe in patients with COVID-19 was still controversial [12,22-26]. At this time, the idea that the use of NSAID leads to an increased risk of severe forms of COVID-19 and of fatality was widely spreading among the population and diffused by the media and various medical authorities with mass information campaigns to stop consumption of NSAID [10,27]. It seems widely acknowledged that many people have stopped to use NSAID, especially in self-medication, during this period. In France, a 70 % decrease of NSAID delivery by drug stores and pharmacies has even been observed at the end of march 2020 (*i.e.* from the beginning of the lockdown period) [27]. A decrease in NSAID consumption may therefore have occurred at this time. This fact might be due to a cautionary note regarding the use of NSAID during the COVID-19 pandemic and coming from the French health authorities and broadcasted by the media [27]. Yet, the influence of NSAID on the development and the severity of soft tissues infections, especially head and neck cellulitis of odontogenic origin, is still controversial today [12,28-30]. We think that the hypothesis of the decreasing of cellulitis of odontogenic origin due to a

lower consumption of NSAID related to the COVID-19 pandemic should be taken into account. In this case, the potential role of NSAID in the pathophysiology of severe cellulitis could thus be reinforced.

The observed difference between OMF centers concerning the number of head and neck cellulitis of odontogenic origin during the lockdown period compared to a normal period was also quite unexpected. This finding might be explained by several factors, such as the differences that exist regarding organizational aspects for emergencies management, the depending population pool, the differences in precariousness and other risk-factors related to the population pool or even the differences in coding practices among OMF departments.

In conclusion, the reasons to explain such findings seem therefore multifactorial: organizational reasons leading to earlier management and antibiotics than usual, patients' fear to seek for medical management in COVID-19 hospitals, usual excess in surgical drainage indications or decreased NSAID consumption. Those results could thus be linked to a possible decrease of the incidence of cellulitis of odontogenic origin in the general public during this lockdown period which obviously cannot be proven. It would be of great interest to find out the explanation of that significant decrease of the incidence of head and neck cellulitis in order to improve the prevention of this potentially life-threatening disease in the future.

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## **Compliance with Ethical Standards**

**Conflict of Interest:** All the authors declare that they have no conflict of interest. They all agree with the scientific content of the manuscript as well as with the order of authors. They have effectively contributed to this work and are familiar with its contents.

**Ethical approval:** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The present study was approved by the local ethical committee of Angers University Hospital (Protocol agreement number 2020/55) and by the French data regulatory authority, the ‘Commission Nationale de l’Informatique et des Libertés’ (CNIL) with the registration number ar20-0057v1.

**Informed consent:** For this type of study, formal consent is not required.

## Legends of figures

**Figure 1:** Total number of patients admitted for head and neck cellulitis of odontogenic origin in 2018, 2019, and 2020 in oral and maxillofacial surgery departments of 18 French public hospitals. \* indicates a significant difference *vs.* years 2018 and 2019.

**Figure 2:** Number of patients per hospital admitted for head and neck cellulitis of odontogenic origin in 2018, 2019, and 2020

**Figure 3:** Percentage of head and neck cellulitis of odontogenic origin during the lockdown period compared with a similar control period (considered as 2018 and 2019), in all included oral and maxillofacial surgery departments.

**Table 1:** General epidemiological characteristics: head and neck cellulitis during the first 2020 lockdown – data from 18 oral and maxillofacial surgery departments in French public hospitals.

**Table 2:** Average decrease of head and neck cellulitis of odontogenic origin admission rate during the 2020 lockdown period compared with average rates during the same period in 2018 and 2019.

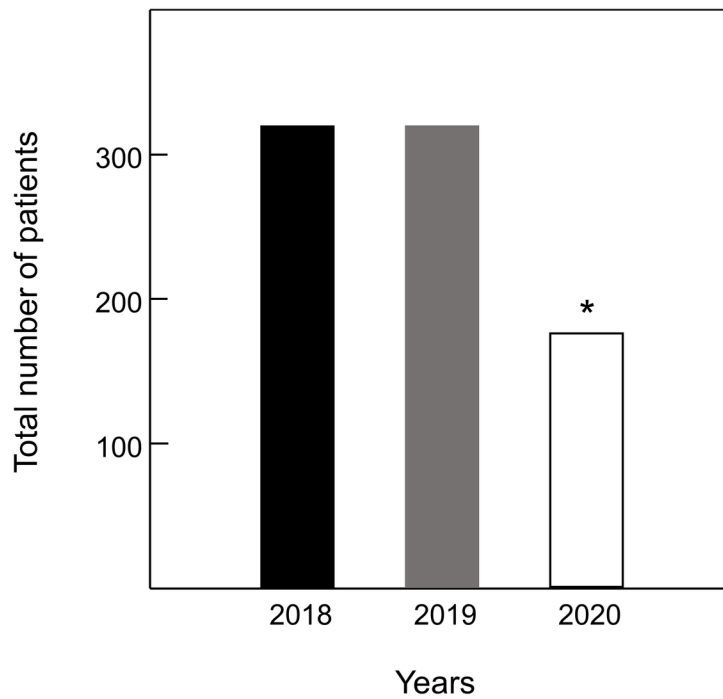


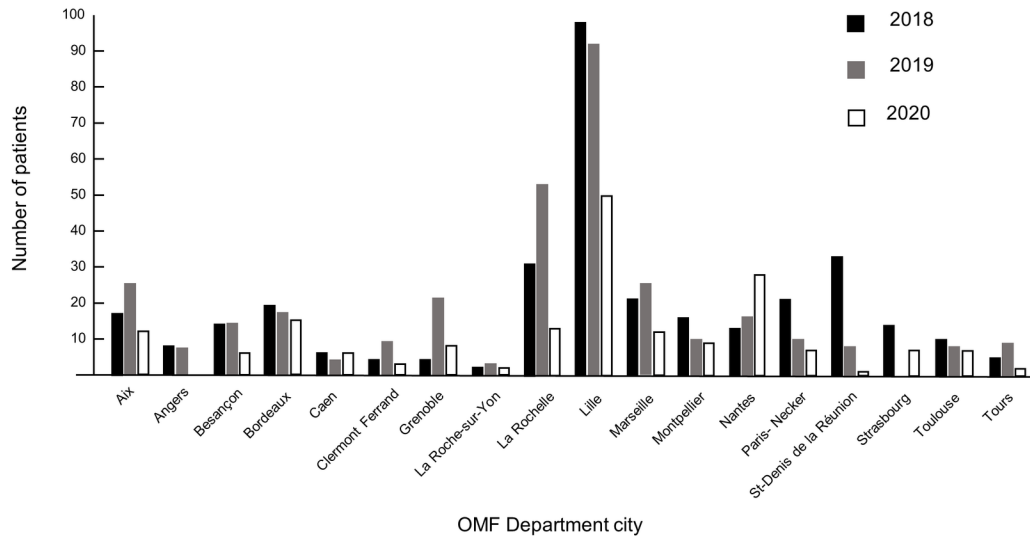
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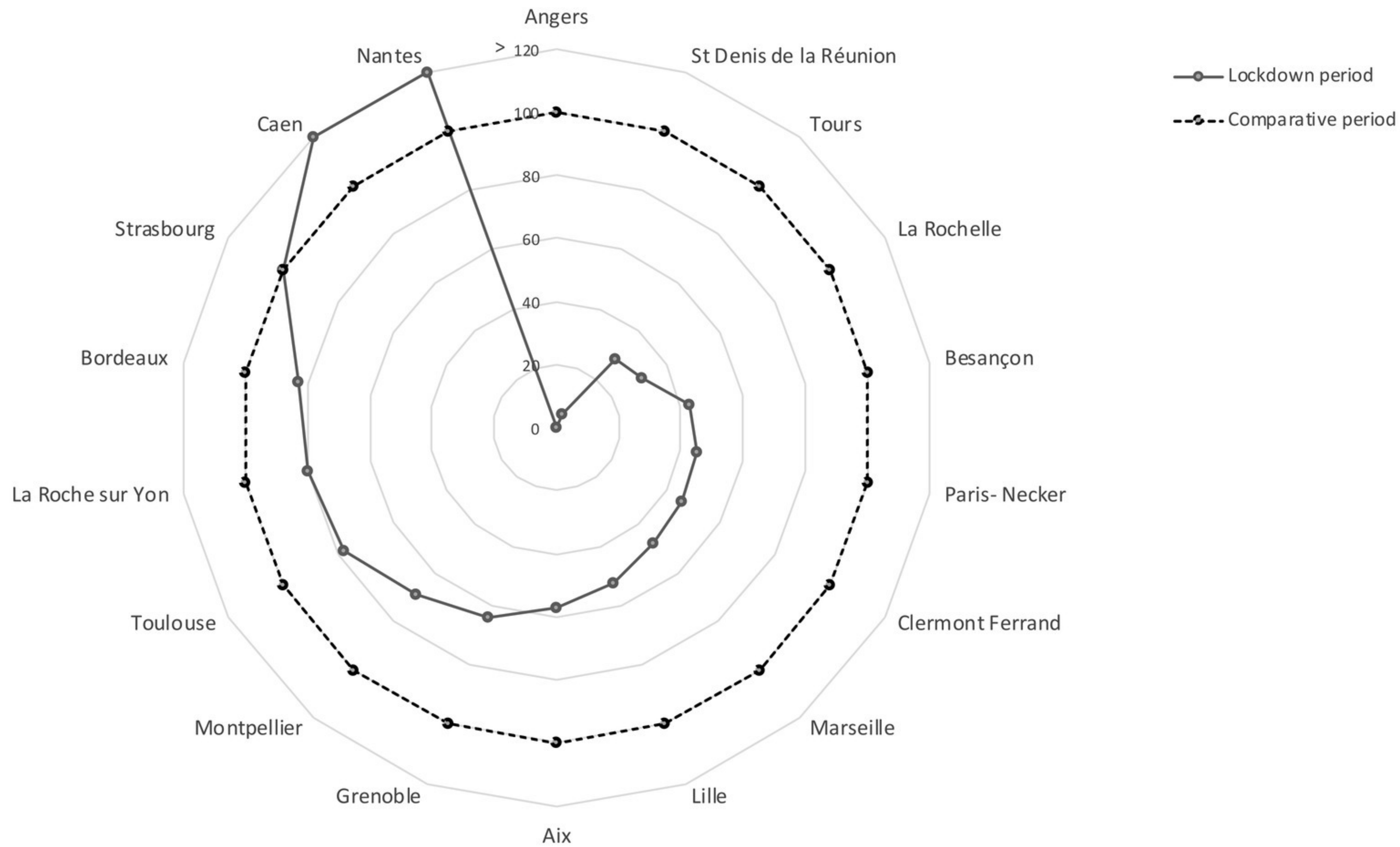
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	2018	2019	2018/2019 (mean)	2020
Patients, <i>n</i>	334	333	333 ± 0.70	187 <sup>a</sup>
Age (years), <i>mean ± SD</i>	38.53 ± 21.83	39.14 ± 21.44	38.83 ± 21.63	36.24 ± 21.48

<sup>a</sup> Indicates a significant difference 2020 vs. 2018 and 2019

**Table 1:** General epidemiological characteristics: head and neck cellulitis during the first 2020 lockdown – data from 18 oral and maxillofacial surgery departments in French public hospitals.

City	Average cellulites incidence decline (%)
Angers	100
St-Denis de la Réunion	95.12
Tours	71.42
La Rochelle	69.04
Besançon	57.14
Paris-Necker	54.83
Clermont Ferrand	53.84
Marseille	52.17
Lille	47.36
Aix	42.85
Grenoble	36
Montpellier	30.76
Toulouse	22.22
La Roche-sur-Yon	20
Bordeaux	16.66
Strasbourg	0
Caen	-20
Nantes	-93.10

**Table 2:** Average decrease of head and neck cellulitis of odontogenic origin admission rate during the 2020 lockdown period compared with average rates during the same period in 2018 and 2019.