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Original Research Article

A retrospective case study of laryngeal edema causing airway obstruction immediately post COVID-19 vaccination

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ABSTRACT

Background: Laryngeal edema is defined as abnormal accumulation of fluid and swelling in the tissues of the larynx commonly associated with laryngeal injuries and allergic causes. The objective of this study is for the prompt recognition and management of laryngeal edema caused by an anaphylaxis reaction after receiving the COVID-19 vaccination from Pfizer-BioNTech, which is extremely important in view of its high morbidity and mortality rate.
Methods: A retrospective case reviews was conducted for all health care workers in Sabah who were administered COVID-19 vaccination from Pfizer-BioNTech from February 2021-April 2021.
Results: The mean age of study population in present study was found to be 33 years. Total of 42 patients were admitted during the period of 6 weeks out of 5000 health care workers who were vaccinated. Females constituted 64.3% of the study population while males constituted 35.7%. The clinical signs of laryngeal edema were dysphagia; the sensation of a lump in the throat; a feeling of tightness in the throat; voice changes, including hoarseness and roughness; and dyspnea within the period of 3 to 5 minutes post Pfizer COVID-19 vaccination. All patients received appropriate management using standard guidelines.
Conclusions: The administration of the COVID-19 vaccination from Pfizer-BioNTech is life-threatening, however, its identification may aid in prompt emergency management in the future. Referral to an otorhinolaryngologist is necessary for patients who experience immediate or severe reactions.

Keywords: Laryngealedema, Vaccination, Sabah, COVID-19

INTRODUCTION

Laryngeal edema is defined as abnormal accumulation of fluid and swelling in the tissues of the larynx commonly associated with laryngeal injuries and allergic causes. Laryngeal edema is mostly present due to anaphylaxis. It is the most serious manifestation of an immediate allergic reaction and one of the most common emergency events in allergology.[1,2] Another common manifestation of laryngeal edema is present in patients post endotracheal extubation, which could manifest as varying degrees of edema, ulceration, granulation/ restricted vocal cord mobility which results in airway lumen narrowing.[3] Laryngeal edema, represents common cause for difficulty breathing and/or stridor after anaphylaxis reaction.

Malaysia started their vaccination campaign with the Coronavirus disease 2019 (COVID-19) vaccination by world health organization (WHO) in early 2021.[4] There were reports of few cases of anaphylaxis within minutes after the administration of the Pfizer/BioNTech messenger RNA (mRNA) vaccination.[5-9] This was alarming as anaphylaxis due to vaccinations is rare, specifically present in 1 case per million. The reports of the cases of anaphylaxis therefore are likely to affect the public's perception of being vaccinated.

The objective of this study is for the prompt recognition and management of laryngeal edema caused by an anaphylaxis reaction, which is extremely important in view of its high morbidity and mortality rate.[1] It is first important for physicians and surgeons to be aware of the clinical profile of laryngeal edema caused by an anaphylaxis reaction and to be cognizant of the current trends after receiving the Pfizer/BioNTech vaccination in outcomes resulting from this condition.[7,8] This report describes our 2-month experience of clinical profile and outcomes in patients developing laryngeal edema after receiving the Pfizer/BioNTech vaccination among frontliners at a tertiary care hospital in Kota Kinabalu, Sabah, Malaysia.

METHODS

This was a retrospective study of patients admitted with laryngeal edema post COVID-19 vaccination for a period of 3 months from February 2021 to April 2021 under the care of department of otorhinolaryngology at hospital Queen Elizabeth, Kota Kinabalu, Sabah, Malaysia. We abstracted the information from hospital records, keeping the identity of the patients anonymous. Information such as demographics, presenting symptoms and signs at admission, precipitating factors like intercurrent illnesses were noted and tabulated using MS word and MS excel. Data was also abstracted based on treatments given and the outcome of patients during hospitalization. Odd's ratios were calculated associations with a 95% confidence interval. Ethical considerations were widely ensured throughout the study.

Inclusion criteria

The diagnosis of laryngeal edema among healthcare works after receiving first dose of COVID-19 vaccination from Pfizer-BioNTech with symptoms such as dysphagia; the sensation of a lump in the throat; a feeling of tightness in throat; voice changes, including hoarseness and roughness; and dyspnea were included in study.

Exclusion criteria

This consisted of other non-health care workers who developed symptomatic anaphylaxis after receiving the first dose of COVID-19 vaccination from Pfizer-BioNTech.

Treatment protocol

For the management of all admitted patients, we followed standard guidelines. Intravenous fluid, oxygen inhalation, intramuscular adrenaline, intravenous hydrocortisone and intravenous dexamethsone were administered.[10]

RESULTS

A total of 42 patients were admitted within the period of 6 weeks. All patients received appropriate management using standard guidelines.[9] 27 females (64.3%) were under observation; 2 patients were above 40 years old; 12 patients were above 30 years old, and 13 patients were below 30 years old. 15 males (35.7%) were under observation; 5 patients were above 35 years old, and 10 patients were 30 years old and below. Patients developed symptoms of laryngeal edema were dysphagia; the sensation of a lump in the throat; a feeling of tightness in throat; voice changes, including hoarseness and roughness; and dyspnea within period of 3 to 5 minutes post Pfizer COVID-19 vaccination.[1] Only 1 patient developed severe adverse reaction which needed high dependency care. No deaths reported during this study.

Table 1: Relationship between gender and age onset of disease.

Age group (Years)	Males (%)	Females (%)	Total (%)
20-30	10 (43.5)	13 (56.5)	23 (100)
30-35	0	12 (100)	12 (100)
35-45	5 (71.4)	2 (28.6)	7 (100)
Total	15 (35.7)	27 (64.3)	42 (100)

Using chi square test of significance, chi square value-14.79, p<0.001

In the present study, it was found that the females from the age groups 20-30 years (56.5%) and 30-35 years (100%) had a higher chance of onset of the disease and study subjects of 35-45 years of age had a lower rate of contracting the disease. The difference of disease burden in the age group of 20 to 30 years old and 35 to 45 years old among males and females were found to be statistically highly significant (p<0.001, DF=2).

The mean age of study population is 33 years. Maximum incidence of disease (100%) was found in the age group of 30-35 years and around 56.5% was found in the age group of 20-30 years. The disease burden was found to show a declining trend as age increased to >35 years.

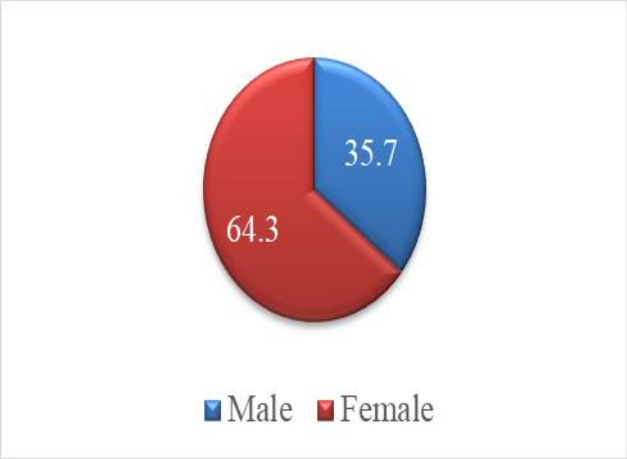

Figure 1: Distribution of study population according to gender.

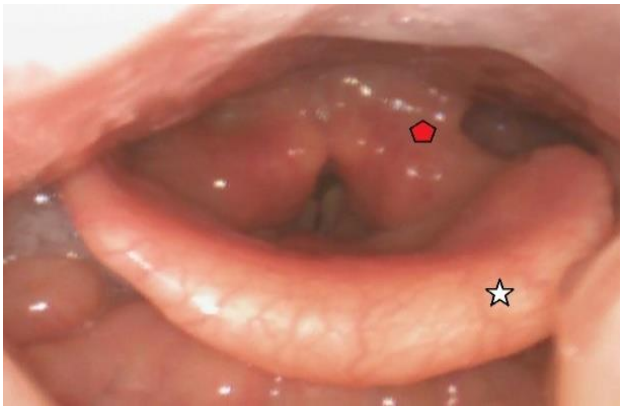

Figure 2: Red and white Pentagon-arythenoid.

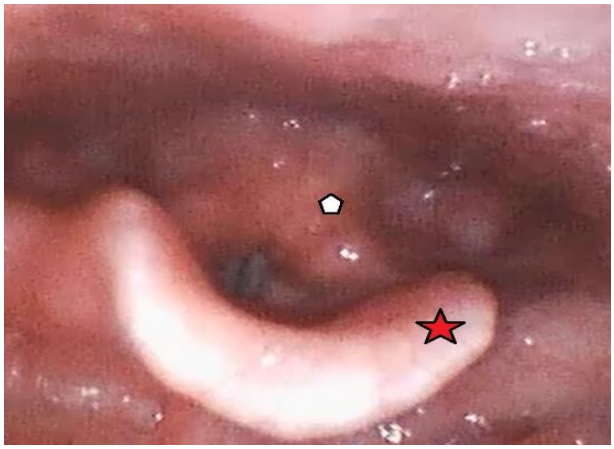

Figure 3: White and red star-epiglottis.

Both Figure 2 and Figure 3 respectively as demonstrated above were taken from patients who were given Pfizer-BioNTech COVID-19 vaccinations. These images were taken using C-MAC video laryngoscope, which shows edema of the laryngeal inlet (arytenoids). This developed within 3 to 5 minutes post COVID-19 vaccination administration.

DISCUSSION

The present study reports that among 5,000 health care employees, 0.8% were diagnosed with laryngeal edema after receiving the first dose of an COVID-19 vaccination from Pfizer-BioNTech. There were other similar reported cases as reported by Ohki et al where patients developed larynx edema after vaccination.[11]

In this case study we present the difference of disease burden in the age group of 20 -30 years and >30 years was found to be statistically highly significant as reported by Zhao et al and Sole, Dirceu et al.[12,13] Based on our findings, the maximum incidence of disease (64.3%) was present among female patients and around (56.5%) was found in the age group of 20-30 years. These findings were comparable to a study conducted by Darmon et al and as well Ho et al.[14,15] Some studies report that females are twice as likely to have drug induced anaphylaxis than males (e.g., female/male odds ratio [OR] 2.20) as reported by Sole, Dirceu et al.[13]

In the present study, laryngeal edema was more commonly reported after local allergen ingestion, post-intubation, drug-induced anaphylaxis and after traumatic events to the neck region. To our knowledge, the underlying cause for the reaction is unclear. Most of our reported cases were presented without other systemic reactions (e.g., Cutaneous reactions, facial edema and others include large local reactions), which is not typical of an anaphylaxis reaction.[16]

The COVID-19 vaccination from Pfizer-BioNTech that was recently introduced for global emergency vaccination use is a messenger RNA (mRNA)-based vaccination (tozinameran, BNT-162b2), using lipid nanoparticles to facilitate the transport of mRNA into cells.[16,17] In our present study, the COVID-19 vaccination from Pfizer-BioNTech was used among our health care workers and based on our findings, the vaccine contains several excipients and lipids, one of them based on polyethylene glycol [PEG] 2000, which is an allergenic potential.[18] The severity and rapid onset of the few reported reactions to the vaccination further increased suspicion towards PEG. We were not able to fully investigate all possible triggers of the laryngeal edema, however, a common trend in patients that developed this had recently received the COVID-19 vaccination from Pfizer-BioNTech. There were also other published cases which reported similar findings.[9] Thus, we suspect that isolated laryngeal edema is related to the COVID-19 vaccination.

Based on our study, patients received intramuscular adrenaline and intravenous of hydrocrotisone 100 mg for mild cases and severe cases received an additional of Intravenous Dexamethasone 8mg regardless of the state of their airway obstruction. The administration of corticosteroid has shown a significant improvement in symptoms and reduced the duration of hospital stays during admission, as similarly reported by Liyanage et al and Choo et al.[19,20] In cases involving laryngeal edema, careful observation of the patient in hospital and oxygen therapy may be sufficient. When laryngeal edema progresses and patients develop respiratory failure, ventilation via mask and further emergency procedures such as tracheostomy and intubation may be necessary. If no other treatment is possible, an emergency cricothyrotomy should be performed without delay.

A major limitation of our study is its retrospective case and single-center character. Additionally, other patients who were mildly symptomatic after receiving the COVID-19 vaccination from Pfizer-BioNTech opted not to seek treatment and did not report themselves to the hospital. Despite these limitations, it can be concluded from the present study that laryngeal edema is a life-threatening condition and may occur at any age, most commonly young adults. In study most individuals who

developed anaphylaxis reactions after receiving their 1st dose of vaccination had opted to defer 2nd dose.

CONCLUSION

This study reflects a life-threatening event which may occur post COVID-19 vaccination from Pfizer-BioNTech which may help to identify future cases for prompt emergency management. Referral to an otorhinolaryngologist is necessary for patients who experience immediate or severe reactions. This data is reassuring for the millions of civilians who may develop laryngeal edema after mRNA vaccination in the future.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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