Editorial

Guillain-Barré Syndrome Following Viral Infections: Considerations for Future Treatment and Research

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As the world's population grows in an explosive way, the circumstances we live in become more crowed than ever in human history. Although medicine and biotechnology have developed tremendously in the new century, the growing density of population has brought us unexpected challenges in public health. This not only causes the emergence of new viruses but also makes coinfection and super-infection more common than previously (Table 1[1–14]). However, the symptoms of these infections, although severe and life threatening in extreme cases, share some common characteristics in outcomes. Many of them cause Guillain-Barré syndrome (GBS) and respiratory emergency. The case reported by Hariharan *et al*.[15] has provided a good reference for the treatment outcomes of such conditions.

GBS is an autoimmune disorder, in which the immune system attacks the peripheral nervous system. It causes muscle weakness, due to damage to nerve cells and their supporting structures.[16] Different types of GBS feature different types of immune attack. Although it is a relatively rare event, GBS could be life threatening, with bulbar and respiratory involvement. It is reported that in two-thirds of patients, neuropathic GBS occurs after an infection.[17] GBS is a known sequelae of Dengue infection,[18] and has been reported in influenza virus, herpesvirus and hepatitis virus infections, *etc*.[16,19] Literally, any virus infection has the potential to cause GBS. Due to the rising pandemics of Zika virus in recent years, GBS has become a focus of discussion. In 2013–2014, GBS was reported from the areas of Zika virus outbreaks, and in 2015, reported again in Oceania and the Americas. Statistically, during Zika pandemics in French Polynesia, among 28,000 persons under medical care, 38 (0.14%) patients developed GBS, compatible with the acute motor axonal neuropathy subtype of the disease.[20]

In recent years, virus-caused pandemics seem to have a trend of taking off, and the syndromes caused by these diseases have also showed some new and more complicating characteristics. One typical example is the reoccurrence of Zika virus. On its initial appearance in the 1950s, it seemed to be mild.[21] As such, Zika virus infection was considered as benign throughout the 20th century.[22] But, in the recent 2015 outbreak in Brazil, it was reported to be associated with GBS and microcephaly.[23] Considering Dengue and Zika viruses are from the same *Flavivirus* family, it is not surprising that the symptoms of Zika infection are often confused with Dengue virus infection and Dengue-chikingunya super-infections when causing GBS.

In all the cases reported for the 2013–2015 Zika virus breakouts, the infected persons showed mild fevers, headaches and body pains. These symptoms are very similar to those of Dengue and chikingunya infections, two other viral diseases that are often endemic in the same areas and are also transmitted by *Aedes* mosquitoes. Indeed, this may have caused many Zika infections to be mistaken as Dengue or chikingunya. Considering the possibilities of super-infections of multiple viruses, it is very difficult to confirm that the associated GBS is due to which viral infection(s). Even though the example provided by this case report has significant clinical magnificence (without associated thrombocytopenia),[15] the complication is very similar to concurrent Zika virus infection. Under specific conditions that cause respiratory emergency, the treatment used in this case report can be applied to GBS induced by Zika virus infection.

Although GBS is a rare event in virus infection, the lethal consequence needs proper treatment and that's where we should provide corresponding care to the patients. In Table 1, the main viruses causing pandemics in recent years are listed. One thing worth noticing is that most of these viruses can cause GBS and/or respiratory emergency. As the emerging viruses like Zika virus have no proper vaccines to prevent infection, under a condition when there is a new virus pandemic without proper vaccines, the treatment of a severe lethal syndrome becomes the focus of emergency. This paper may provide some valuable references when coping with emerging viruses that can cause GBS and/or respiratory emergency.

Traditionally, the method to treat respiratory emergency usually involves surgical tracheostomy. In this case, percutaneous dilatational tracheostomy (PCT) was performed instead of classical tracheostomy. Compared to the old method, PCT has a smaller size of incision and quicker recovery. Also, PCT is supposed to be a bedside procedure that can be performed by every physician,[24] with less assistance and material.[25] These traits fit the requirements when there is a breakout of viruses and large numbers of patients need to be taken care of. PCT could be a potential lifesaving method when facing certain future emerging virus attacks that cause respiratory emergency. Another critical method used in this case report is IV-Ig immune therapy. Based on the response of the patients while the treatments were going on, it is clear that IV-Ig here plays a key role in the patient's recovery. However, this is not surprising, for IV-Ig immune therapy is already a routine method to treat GBS clinically.

In summary, although this case report provided a specific condition of combined chikungunya and Dengue infection, it could become very typical in future virus pandemics. The successful treatment of this condition provided valuable reference for emerging virus pandemics that may require a similar treatment for GBS and life-threatening breathing problems.

Abbreviations: GBS, Guillain-Barré syndrome; PCT, percutaneous dilatational tracheostomy.

Received: October 9, 2017; Revised: February 9, 2018; Accepted: February 23, 2018

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How to cite this article: Wang L. Guillain-Barré Syndrome Following Viral Infections: Considerations for Future Treatment and Research. *Exploratory Research and Hypothesis* 2018;3(1):4–5. doi: 10.14218/ERHM.2017.00035.

Table 1. Recent virus pandemics and their relationship to Guillain-Barré syndrome and respiratory distress syndrome

Outbreaks	Year	May cause Guillain-Barré syndrome	May cause respiratory distress syndrome
Severe acute respiratory syndrome	2002–2003	Unknown	Yes[1]
Chikungunya	2006	Yes[2]	Yes[3]
Zika virus in Yap Island, Federated States of Micronesia	2007	Yes[4]	Unknown
H1N1 influenza	2009–2010	Yes[5]	Yes[6]
Measles in Congo	2010–now	Unknown	Yes[7]
Middle East respiratory syndrome	2012–now	Unknown	Yes[8]
Zika virus in French Polynesia	2013–2014	Yes[9]	Yes[10]
Chikungunya	2013–now	Yes[2]	Yes[3]
Ebola in West Africa	2013–now	Unknown	Yes[11]
Zika virus in Brazil and Colombia	2015–now	Yes[12]	Yes[10]
Dengue fever in Hawaii and tropical Asian islands	2015, 2017–now	Yes[13]	Yes[14]

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