

## Injection-Induced Trigeminal Neuralgia and Cervical Radiculopathy after Vaccination against COVID-19: A Case Report

Manuel Dwiyanto Hardjo Lugito<sup>1\*</sup>, Febrina Rahmayanti<sup>2</sup>

1. Department of Oral Medicine, Faculty of Dentistry, Universitas Prof Dr Moestopo Beragama), Jakarta-Indonesia.

2. Department of Oral Medicine, Faculty of Dentistry, Universitas Indonesia, Jakarta-Indonesia.

### Abstract

Vaccine is important to defend human against SARS-CoV-2, the coronavirus that cause COVID-19. Recently, several cases of allergic reaction after injection of the mRNA COVID-19 Vaccine had been reported, which has resulted a recommendation to prohibit any individual with a record of a serious or type 1 hypersensitivity reaction to certain of the vaccine constituents. To report the treatment and pathogenesis of injection-induced trigeminal neuralgia and cervical radiculopathy of 25 years old female patient after Covid-19 vaccine. The patient reported pain less than 24 hours on left shoulder, mandibular and periauricular after received an intramuscular Covid-19 vaccine. She was diagnosed with injection-induced trigeminal neuralgia and cervical radiculopathy. Previous clinical diagnosis was adverse vaccine reactions and neuromuscular injuries. Radiograph examination revealed dextroscoliosis. Acetaminophen was given for 4 days and the complaint was diminished on the fifth day.

This case emphasizes the importance of taking thorough history especially patient with scoliosis before receiving intramuscular vaccines injection.

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### Introduction

Vaccine is important to defend human against SARS-CoV-2, the coronavirus that cause COVID-19. Vaccines generate extensive amount of high affinity virus-neutralizing antibodies and expected to avert infection and prevent unfavourable consequences.<sup>1,2,3</sup> Priority uses of COVID-19 vaccines include medical workers and sociodemographic groups susceptible to infection at notably higher risk of severe disease or death.<sup>4</sup> In communities across the Indonesia, the convenience and no cost of vaccination offered through health drives, community centers, health departments, and retail pharmacies have resulted in a higher vaccination rate.<sup>5</sup>

Sinovac, is an aluminium-hydroxide-  
adjuvanted, inactivated whole virus vaccine.

Sinovac utilizes particles of inactivated SARS-CoV-2 (CN02 strain) via traditional approach to produce antibodies.<sup>6,7</sup> The components of vaccine such as gelatine, egg proteins or altered viral particles can activate nonspecific inflammatory system.<sup>8</sup> Several diseases like bronchial asthma, pregnancy breast feeding, immunocompromised, autoimmune conditions are contraindications and need special precautions before receive Covid-19 vaccines.<sup>9</sup> The most common route of vaccine injection is intramuscular (IM) injection via upper limb<sup>10</sup> and considered safe with rare uncommon neuromuscular complication reported in India, Nigeria and Korea.<sup>11</sup>

The event of vaccine-induced adverse side effects of the most frequently regular vaccines is low, estimations range from 48-830 per 1000000 doses; true allergic reactions, anaphylactic reactions are still a rare event. The site of injection is the most common reaction to vaccines include pain, erythema and swelling.<sup>8,12</sup>

Recently, several cases of allergic reaction after injection of the mRNA COVID-19 Vaccine has been reported, which has resulted a recommendation to prohibit any individual with a

#### \*Corresponding author:

Manuel Dwiyanto Hardjo Lugito,  
Department of Oral Medicine, Faculty of Dentistry, Universitas  
Prof Dr Moestopo Beragama), Jakarta-Indonesia  
E-mail: manuel\_lu@dsn.moestopo.ac.id

record of a serious or type 1 hypersensitivity reaction to certain of the vaccine constituents.<sup>2,13</sup> Nevertheless, only few neurological complications had been discussed yet.<sup>14</sup> In this article, we present and discuss a rare report of female who reported pain at her right cheek, preauricular, and mandible for approximately 24 hours after receiving an IM Sinovac Covid-19 injection.

### Case Report

A 25 years old female patient came to Moestopo Dental Hospital with the complained of sharp pain and numbness at her left shoulder and neck, eventually left jaw and ear after less than 24 hours of the first vaccination with Sinovac. There was no other specific trauma or other history of recent injections to her shoulder. Her other extremities were unaffected. She also reported no preceding infectious illness, drug allergy, recent travels, or contact with sick people.

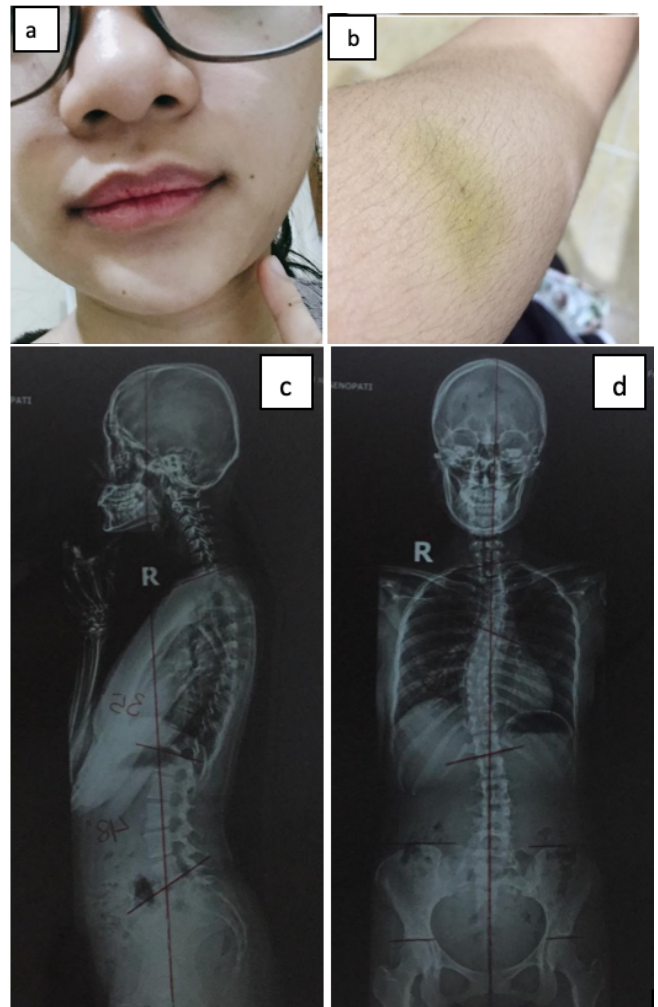
On physical examination, the patient pointed to the area of pain at the midpoint of her left deltoid insertion, which was slightly tender to palpation. There was no atrophy of the left deltoid muscle, loss of sensation on the inferior half of the deltoid muscle, and she was able to abduct her left arm and bend arm at the elbow slowly. The patient had active range of motion of shoulder abduction. She scored a 4 on the Manual Muscle Test (MMT)<sup>10</sup> of the deltoid, indicating good function. Passive flexion of the shoulder was normal. Flexion and extension of the forearm and rotatory movement of the shoulder were normal. Other than low blood pressure, there was abnormal finding from spine radiograph and diagnosed as dextroscoliosis and cervical spinosis on her left superior upper cervical (C2) to inferior cervical (C3-5).

Results of extra oral examinations were swelling of left submandibular lymph node with sharp and stabbing pain in right auriculotemporal, suboccipital and temporal region, cheek and chin. Intra oral examination indicated normal oral mucosa with hypogeusia on right part, deep bite, 38 was extracted.

On the basis of the patient's medical history, physical examination, and reported injection site, the diagnosis of injection-induced trigeminal neuralgia and cervical radiculopathy was made. The patient declined to undergo further diagnostic testing, including nerve

conduction studies and magnetic resonance imaging, because she was not a Medicare beneficiary. Therefore, she was treated symptomatically with analgesics acetaminophen 500 mg tid for 4 days.

After 48 hours, there was no swelling on left submandibular lymph node with reduction of numbness. On the fifth day, she felt normal again without any complains. Two weeks after first shot, she received second shot of Sinovac with only mild pain on her deltoid without any pain on her left neck and face (Figure 1).



**Figure 1.** Swelling on left submandibular lymph node (a), bruising on left m.deltoid (b); full-spine imaging (c,d) in the PA and lateral projection with compressions and dextroscoliosis.

### Discussion

Preceding assessment of future link amongst COVID-19 vaccination and Injection-Induced Trigeminal Neuralgia and Cervical

Radiculopathy, the diagnostic determination of these diseases in this incident is essential to be discussed. Trigeminal Neuralgia can be defined as emergent commonly unilateral severe concise stabbing recurrent occurrence of pain influencing the fifth cranial nerve and caused by compression of trigeminal nerve root and lead to destruction of myelin continuously.<sup>14</sup> Cervical Radiculopathy is a disorder resulting from constriction and/or inflammation of single or several cervical nerve roots.<sup>15</sup> The common manifestations of Trigeminal neuralgia comprise stabbing, paroxysmal, reminiscent of electrical injury, or hot flashes and is restricted to the zone supplied by single or several branches of the trigeminal nerve.<sup>14</sup> Cervical Radiculopathy signs are arm pain with alteration of sensorial, motoric, involuntary movement, or any combination of several signs with or absence of neck pain.<sup>15</sup> Diagnosis is made upon clinical, in accordance with distinctive manifestations in the adequacy of other marked and perceivable diagnosis. Our patient's clinical manifestations were resemblant with the previously mentioned in Injection-Induced Trigeminal Neuralgia and Cervical Radiculopathy. Given her definitive characteristics with diagnostic appearance, medical checkup, and radiographic analysis unclassified for any differential diagnosis we suggest her diagnosis of Injection-Induced Trigeminal Neuralgia and Cervical Radiculopathy with a good level of confidence.

Vaccination through intramuscular (IM) injections in deltoid can cause neurological and muscular injury, via several possible mechanisms.<sup>16,17</sup> These mechanisms include direct needle trauma as consequence of inadequacy of anatomical knowledge of the nerve,<sup>12</sup> immune-mediated inflammatory response (vaccine-induced serum proinflammatory cytokine responses)<sup>16</sup>, acute-onset hypersensitivity reactions or anaphylaxis related to the active vaccine component (antigen) or one of the other components,<sup>8,19</sup> or molecular imitation.<sup>16</sup>

Neurological injury due to vaccination have been reported and debated about the precise mechanism over the development of complication.<sup>16</sup> Injury to axillary and radial nerve as a consequence of faulty deltoid IM injections and an overlook of the relevant anatomy. The recommended location site of deltoid muscle, the preference of needle size and its angulation are

important for obtain maximum efficacy of the vaccine as well as minimize adverse events.<sup>12</sup> According to her history, injection site and physical examination, hypothesize of trigeminal and cervical radiculopathy was made.

Although the process of vaccination was not documented, the site of injury could be estimated was the anterior branch of the axillary nerve which supply anterior part of the deltoid muscle. When direct needle trauma harm the nerve, pain will emerge instantly as our patient did. The sequelae of nerve injury can vary between minor into severe transient sensory interference even paralysis.<sup>12</sup> Nevertheless, injectate-related chemical neuropathy and shoulder injury related to vaccine administration (SIRVA) were also decided as differential diagnoses. While SIRVA to be a possible diagnosis, the patient presented with isolated mild deltoid paralysis. The symptoms of SIRVA is marked by pain and limited function due to pain as a result from localized inflammatory response, contrary to paralysis due to direct nerve damage.<sup>12</sup>

Another possible mechanism is non-specific or specific activation of the inflammatory system after vaccination could be triggered by aluminium hydroxide or inactivated viral particles.<sup>8,10,13</sup> This inflammation in conjunction with dextroscoliosis and cervical spinosis on her left superior upper cervical (C2) to inferior cervical (C3-5) is postulated act as an irritant to dorsal root of cervical nerve. This irritation could induce peripheral nerve compression of the axillary nerve (anterolateral aspect of the deltoid muscle) from its nerve ending which stimulate the release of neuropeptides from nociceptors and their pathways leading to the cervical radiculopathy.

To the best of our knowledge, the axillary nerve is arisen as a part of the terminal branches of posterior cord of brachial plexus and was formed by the fifth cervical to first thoracal spinal nerve roots.<sup>17,20,21</sup> The fourth cervical nerve is also ramified descending to link with the fifth cervical nerve and take part in the development of the brachial plexus (pre-fix).<sup>22</sup> The cervical plexus configures from the ventral rami of first cervical to fourth cervical and anastomose with the facial nerve, hypoglossal nerve, spinal accessory nerve, vagus nerve, and the sympathetic trunk.<sup>22,23</sup>

The superior cervical segments as in the caudal part of the spinal trigeminal nucleus have

an extend over in the middle of trigeminal and afferents cervical sensory fibers assertion in the cerebrospinal nervous system. These fibers in the trigeminal nucleus caudalis and neurons the central nervous system have a functional continuous sequence in the reaction of cranial pain. The nerve cells within the trigeminal nucleus caudalis experience alteration in conjunction with lateral cervical nucleus neurons as the superior cervical nerve is stimulated. In addition, some section of the limb and trunk can fire off input to lateral cervical nucleus neurons. Several involuntary physical processes in internal organ function is regulated by vagus nerve and hypoglossal nerve.<sup>23</sup>

Excitation of nerve C-fibers and  $\alpha\delta$  fibers as nociceptors of ophthalmic division of the trigeminal nerve, lead to the release of substance P (SP), calcitonin gene-related peptide (CGRP), and neurokinin A. Neuropeptides cause cell activation within medullary dorsal horn of Trigeminal Nucleus Caudalis into the second cervical spinal segment.<sup>24</sup> In addition, cervical compression of the fifth cervical or sixth cervical nerve roots could lead to restricted axillary symptomatology.<sup>20</sup> Symptomatic cervical radiculopathy usually will resolve immediately with moderate treatment which is used to treat unspecified neck pain<sup>16</sup> as the patient experienced.

## Conclusions

This case emphasizes the importance of taking thorough history especially patient with scoliosis before receiving intramuscular vaccines injection. Imaging studies, the nerve conduction velocity test, and electromyography can be administered to confirm the diagnosis and rule out other causes of nerve injury.

## Declaration of Interest

The authors report no conflict of interest.

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