



## Case Report

## Single level anterior cervical discectomy and fusion in multilevel herniated disc, a case report



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## ABSTRACT

**Introduction:** In managing cervical disc herniation, several treatment options are available. Anterior cervical decompression and fusion (ACDF) remain the gold standard in symptomatic cervical disc herniation. However, multilevel ACDF could diminish the motion of the segment. We planned to salvage the movement by only using single-level ACDF in our patient and osteophyte removal to reduce compression caused by spurs formation related to the herniated nucleus.

**Methods:** A male patient, 43 years old, came with a chief complaint of neck pain three months ago. The pain was intermittent, radiated into both hands. There was midline tenderness, and his sensation was decreased from the level of C5 below. We managed to diagnose the patient with Cervical Herniated Disc (CHD) using MRI and performed single-level ACDF.

**Results:** After the operation, osteophyte formation was safely removed, the pain and the tingling sensation was no longer felt. The VAS score was reduced from 4 to 1. We observed good spinal fusion in the post x-ray imaging.

**Conclusion:** Anterior cervical discectomy and fusion after osteophyte removal proved successful for our patient treatment, with improvement from neck and arms symptoms. However, longer-term evaluation needs to be planned further to assess the result and possible complications of single-level ACDF.

## 1. Introduction

Vertebrae with intervertebral discs form the vertebral column. It includes the cervical, thoracic, lumbar, and sacral regions that extend from the skull base to the coccyx. The cervical is constructed by seven vertebral bodies and intervertebral discs anchored to the bodies through endplate areas. Anatomically, the disc is composed of nucleus pulposus and annulus fibrosus. The disc herniation is the condition when the inner nucleus pulposus protrudes through the annulus fibrosus [1].

Herniation of the disc in the cervical area may occur suddenly from a traumatic incident or overtime by degenerative and mechanical changes. The most common level of cervical disc herniation in the cervical (C) 5–6 and 6–7 vertebrae compresses C6 and C7 roots. The symptoms include pain on the posterior upper arm, tricep weakness, wrist drop, and paresthesia on the middle finger area [2].

The exact incidence data of herniated cervical disc in a young adult is minimal. This is caused by the nature of the disease, which has variable symptoms and its difficulty to be precisely diagnosed. The incidence of

cervical disc herniations was 18.6 per 100,000 populations, and it peaked in the sixth decade of life [3].

The common risk factors for the cervical herniated intervertebral disc are age, lack of regular exercise, tobacco, poor posture such as incorrect lifting or twisting, and injury [4]. Some jobs, such as physician and dentist, seem to have a higher incidence of cervical disc herniation than the general population. However, this phenomenon's explanation requires further prospective studies to identify possible causation or other unknown confounders [4,5]. For different levels such as lumbar disc herniation, the risk factors are age, gender, body mass index, smoking, herniation type, diabetes, and herniation level itself [6]. Several treatment options are available in managing cervical herniated disc (CHD), ranging from conservative treatment to surgical procedure. Education, analgesics, oral and injection of corticosteroid, cervical collar, and physical exercise modifications constitute the conservative option. When it fails, surgery became a modality of choice [7]. Surgical procedures without arthrodesis have been developed to treat cervical disc herniation, whether by anterior or posterior approach. Up until

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now, Anterior cervical decompression and fusion (ACDF) is the gold standard in the case of symptomatic cervical disc herniation [8]. The removal of osteophyte is essential in preserving the neuronal and soft tissue in ACDF. These osteophytes have to be removed; otherwise, cord impingement will be left after the surgery [9].

This case report aims to introduce a rare case of multilevel cervical HNP in adults with a scoliosis risk factor treated by surgical decompression of the spinal canal of C5–6 via an anterior approach. The osteophyte was also removed, and total discectomy was done to provide adequate decompression. The stability of the cervical vertebra was achieved by fusion. To evaluate and analyze the outcomes of these techniques and determine whether it is an effective procedure for treating multiple levels of cervical HNP, we followed up the patient by six months evaluation using the clinical and radiological examination. This case report has been reported in line with the most recent criteria for case report: SCARE criteria [10].

## 2. Case illustration

A male patient, 43 years old, came with a chief complaint of neck pain three months ago. The pain was intermittent, radiated into both hands. The patient also complained of tingling sensation and numbness. The pain was relieved with rest. He underwent an X-ray and MRI examination in a private hospital and was diagnosed with spinal stenosis at the cervical level. After that, he was referred to our hospital. Patient present to our hospital by himself. There was no history of associated fever and weight loss. The patient was an administrator at the storage unit of a company and often worked for hours with his computer.

In the physical examination, we found no deformity (Fig. 1). There was midline tenderness, and the motoric strength was normal in all extremities. The sensory was decreased from the level of C5 and below, especially on the left side. There were no disturbances in autonomic function. We found no increase in physiological reflexes, and no pathological reflexes emerged on examination. The range of movement of the spine was normal. ROM of cervical flexion-extension was 0–30°, lateral flexion was 0–35°, rotation was 0–50°. ROM of thoracolumbal flexion was 0–80°, extension was 0–25°, lateral flexion was 0–35°, and rotation 0–45°.

The preoperative laboratory investigations were within normal limits. The Radiograph examination of cervical in anteroposterior and lateral view revealed the decreased cervical lordotic, osteophyte

formation, and upper endplate sclerotic at the level of C6 (Fig. 2). From the non-contrast thoracolumbar magnetic resonance imaging (MRI) examination, we obtained a bulging disc of C5–6 and C6–7 that compressed the thecal sac. There was also a narrowing of the bilateral foramen of C5–6 (Fig. 3). The thoracolumbar xray was also done as the appendix due to the scoliosis posture of the patient.

From the data above, we diagnosed the patient as radiculopathy due to herniated disc of C4–C5, C5–C6, C6–C7 with idiopathic scoliosis Lenke classification 5BN and decided to perform anterior cervical discectomy and fusion (ACDF) of C5–C6.

## 3. Intra operative procedure

Before the operation, the patient was given 2gr of ceftriaxone 1 h before the operation. The patient was positioned in a supine position under general anesthesia. The aseptic procedure was performed on the operation site. A longitudinal incision was made on the left neck at the skin fold nearest to C5–6. The incision was made layer by layer until the C5–C6 vertebrae were exposed. A total discectomy was done anteriorly. After all the disc material was removed, we did osteophyte removal at the anterior and posterior vertebral body of C5 and C6. This procedure is mandatory to ensure the decompression of the spinal cord due to spur formation posteriorly and to make a good plate purchase later on the anterior body. After we did these procedures, C-arm confirmation was done to ensure that all the spurs were already removed. The cervical cage and anterior plate and screw were done subsequently at the anterior column of C5 and C6 (Fig. 4). Surgical procedure was done by surgical operator, a Consultant in Orthopaedic Spine Surgery, with 17 years working experience.

After the operation, we did a radiological examination to confirm the plate (Fig. 5). The pain subsides, and the tingling sensation was slowly diminished after the procedure took place.

## 4. Follow up

One month after the operation, the patient felt reduced pain and diminished tingling and numbing sensation. At first, the pain was felt around 3–4 on the visual analog scale (VAS), and after the operation, VAS was reported as low as one on VAS. The tingling and numbing sensation were no longer reported after the procedure. In the radiological examination, we evaluate the implant position, and we could see



Fig. 1. Clinical pictures of patient before operation in Cipto Mangunkusumo Hospital. The cervical has no deformity but the patient was presented with scoliosis at the thoracic and lumbar region.



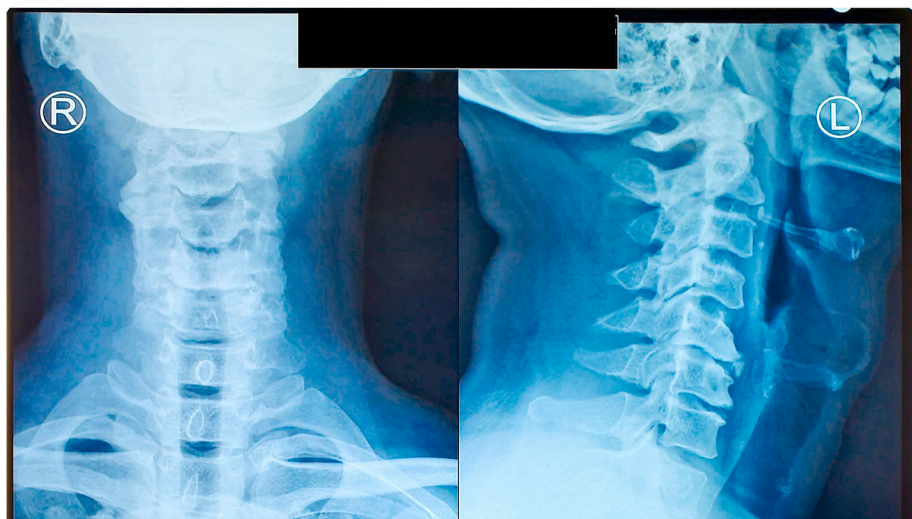


Fig. 2. Anteroposterior and lateral view of cervical radiography, before operation in Cipto Mangunkusumo Hospital. The cervical lordotic is decreased. The body height of C6 was decreased and associated with spur formation that seen in the anterior part.

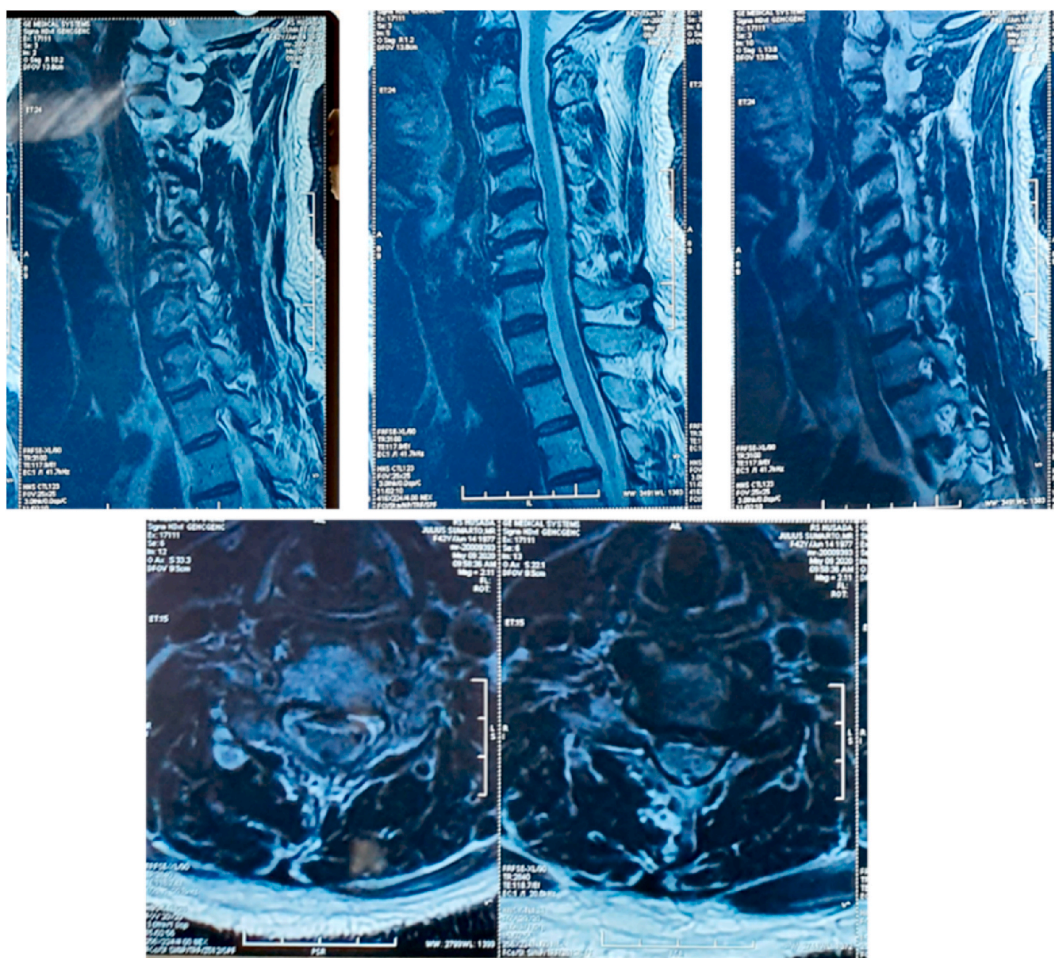
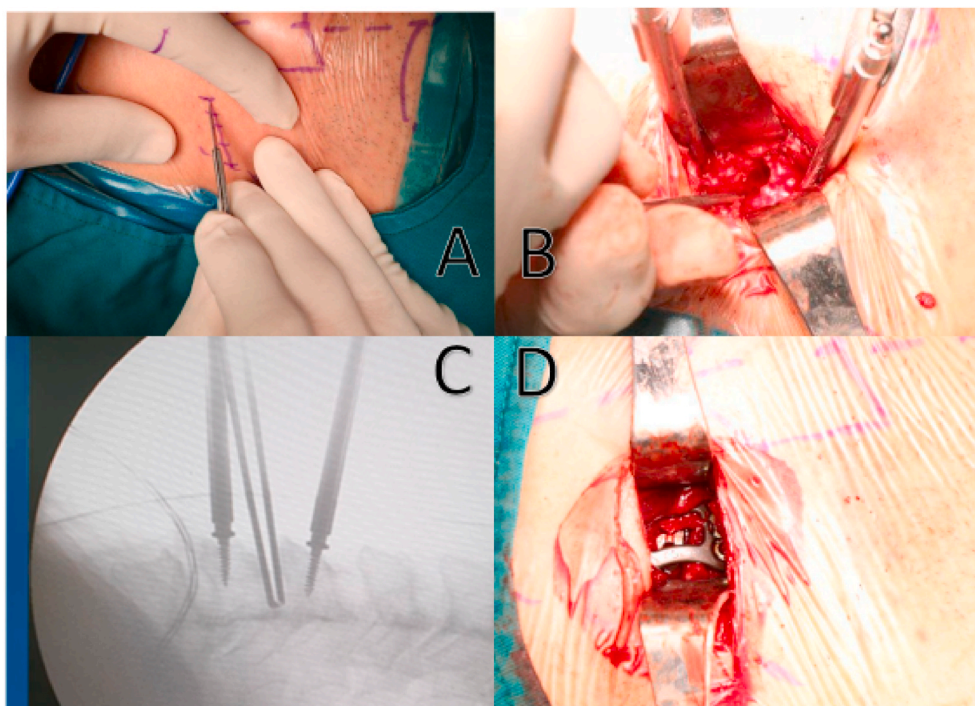


Fig. 3. The Cervical MRI examination showed multiple level of compression that caused by osteophyte on posterior vertebral body and herniated disc especially at the level of C5–C6.

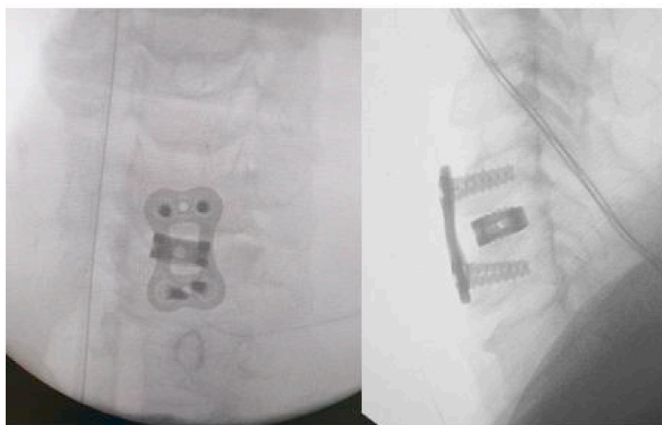
that both the cage and the plate were still in the right place (Fig. 6).

Two months after the procedure, the patient went to our outpatient clinic. He reported that the previous pain that radiated to his upper extremity was already diminished. In radiological evaluation, we

inspected that there was already a sign of bony union. The posterior bridging callous has already taken place, and there was a slight anterior migration of the cage (Fig. 7).



**Fig. 4.** We performed anterior cervical approach(A). The decompression achieved by doing total cervical discectomy of C5–C6 and osteophyte removal at the posterior part of vertebral body that compressed the spinal root(B). Anterior Cage insertion to enhance bone union and provide stability (C). Post decompression and stabilization (D).



**Fig. 5.** Configuration of the ACDF and anterior plate fixation were showed in post operative radiographic examination.

## 5. Discussion

The displacement of the nucleus pulposus of the vertebral disc at the cervical level would result in cervical disc herniation. This condition may further develop into compression of the spinal cord or impingement of the nerve roots, resulting in radiculopathy. Generally, it is considered the result of posterolateral annular stress compounded by the disc's natural degeneration [11]. In the literature, the incidence peaks in the 6th decade of life [3]. This is different from our patient, where our patient is still in the 4th decade of life. Our result is more comparable to a study by Schroeder et al. where the mean age of the patient with cervical disc herniation is around 47–48 years old, slightly more often in a woman [12]. Symptomatic cervical disc herniations patient would complain severe neck and arm pain, typically at the level of its myotomal pattern. In contrast, the sensory symptoms (e.g., burning, tingling)

follow a dermatomal distribution [3]. In our case, the patient felt pain radiating from the neck to the hand, while still maintaining normal motor function. Nevertheless, the sensory perception was diminished in the patient. Numbness and tingling sensation were also reported. These several similar symptoms were also reported in several studies [11,13,14].

Plain radiography only provides limited data on CHD but could be used to rule out instability or pathologic changes in the bone. Oblique views of the cervical spine can show a narrowing of the neuroforamina secondary to degenerative changes. Cervical instability may be visualized with dynamic flexion and extension [15]. In our case, the x-ray examination managed to show the osteophyte on the cervical vertebrae. Osteophytes could cause radiculopathy by compressing the nerve root anteriorly. Although uncommon, osteophytes extending from the ventral portion of the superior articular process can cause compression by narrowing neuroforaminal space [15]. We managed to diagnose the patient with CHD by using MRI. This examination was the need to carefully evaluate the soft tissue that is suspected as the pain generator. Previous research also stated that magnetic resonance imaging was as sensitive as CT-myelography for identifying a diseased segment [15].

The differential diagnosis was degenerative cervical spondylosis. As for degenerative cervical spondylosis, usually occurs in patient between 40 and 60 years old, male predominant. Patient usually a manual labourers with a history of heavy work. Patient commonly present in three clinical syndromes includes axial neck pain, cervical radiculopathy and cervical myelopathy. Symptoms of axial neck pain usually associated with headache and painful neck movements. As cervical radiculopathy present with radicular pain to arms, neck and scapular region, sensory numbness and motor weakness. Cervical myelopathy present with clumsiness in hand and awkward gait. From the x-ray examination can be found narrowing of disc space, osteophyte formation, facet degeneration, vertebral subluxation, bony abnormalities, and ossification in posterior longitudinal ligaments [16].

We performed anterior cervical discectomy and fusion (ACDF) only at the level of C5–C6 in this patient event though the herniation was



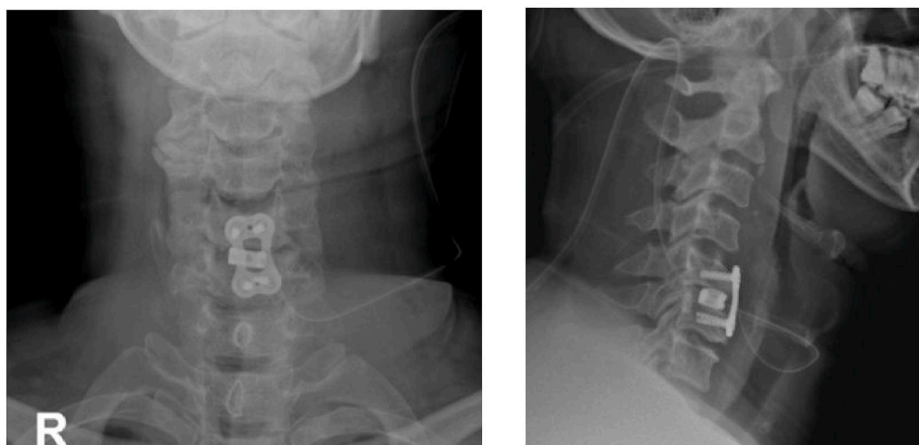


Fig. 6. One month post operative radiological examination we could see that the cage and the plate were still in good position.

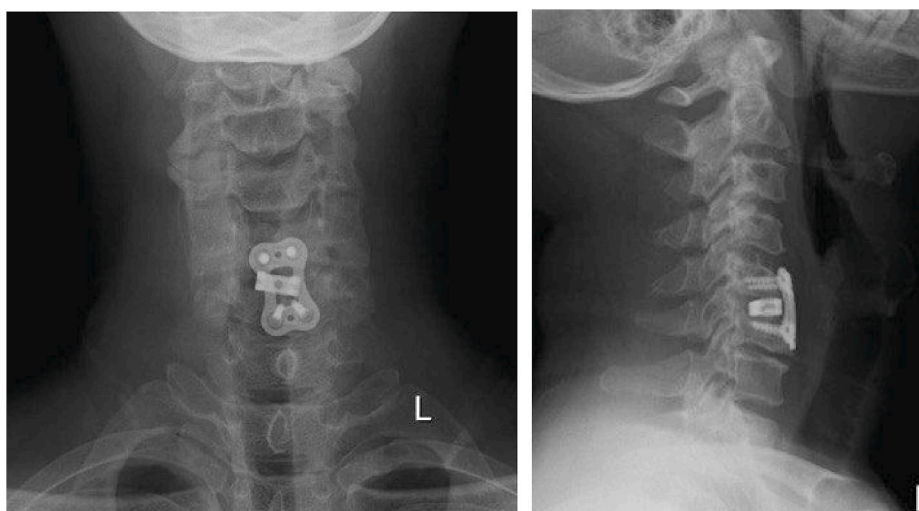


Fig. 7. Radiological Examination were taken 2 months after the surgery. We could see that posterior bridging callous has already taken place and there was slightly an anterior migration of the cage.

multilevel. We did this procedure considering the patient was still in the 4th decade of life, and we want to preserve the mobility of the joint. We also removed the osteophyte on the anterior and posterior side of C5 and C6 vertebral bodies that were mandatory to be done to ensure the decompression. ACDF is the mainstay procedure to treat cervical radiculopathy. It can remove the affected disc materials and augment the compressed cervical foramen. Fusion would provide stability and eliminate the dynamic factor that ignites the pain [15]. Multilevel fusion has been reported to have good results, but it also has drawbacks, such as reducing the physiological motion function of the cervical spine significantly. It would also alter adjacent-level kinematics, resulting in increased biomechanical stresses, leading to accelerated degeneration at adjacent segments [17].

In this patient, osteophyte removal was performed at the anterior and posterior vertebral body of C5 and C6 after all the disc material was removed. This procedure is essential to ensure the decompress of the spinal cord from spur formation posteriorly and make a good plate purchase later on the anterior body. Osteophyte removal could relieve symptom due to it and facilitate the placement of proper screw for anterior stabilization.<sup>20</sup>

Cervical artificial disc replacement (CADR) also one of the options available for a less interventive approach. A study reported that a single level CADR gave a comparable clinical outcome to multilevel ACDF [18]. Another study using cervical arthroplasty showed a better clinical

outcome in multilevel management of CADR than single-level ACDF [19]. Even though these procedures have a good outcome, disc replacement is often out of choice due to our center's socioeconomic and insurance factors.

## 6. Conclusion

Anterior discectomy and fusion of the cervical spine after osteophyte removal proved successful for our patient, with improvement from neck and arms symptoms. osteophyte removal was essential to ensure the decompression of the spinal cord from spur formation posteriorly and make a good plate purchase later on the anterior body. It could relieve symptoms that caused by these osteophytes and facilitate the proper implant replacement for anterior stabilization. However, longer-term evaluation needs to be planned further to assess the result and possible complications of single-level ACDF.

## Declaration of competing interest

The authors declare no conflicts of interest.

## Acknowledgment

The corresponding author, on behalf of all authors, declares that

there is no conflict of interest.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2020.11.064>.

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### Author contribution

Petrus Aprianto contributes to the study concept or design, data collection and writing the paper.

S. Dohar Tobing contributes in the study concept or design, data collection, analysis and interpretation, oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team.

### Consent

Written consent has been received from the subject.

### Registration of research studies

Not required.

### Guarantor

S. Dohar Tobing is the sole guarantor of this submitted article.

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