



Understanding repetitive strain injury (RSI) in the light of Ayurveda

Dr. Kavya K ^{1*}, Dr. Shreevathsa ²

¹ PG Scholar, Department of Ayurveda Samhita & Siddhanta, Governemnt Ayurveda Medical College, Mysuru, Karnataka, India

² Professor and HOD, Department of Ayurveda Samhita & Siddhanta, Governemnt Ayurveda Medical College, Mysuru, Karnataka, India

* Corresponding Author: Dr. Kavya K

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Abstract

Repetitive stress injury (RSI) is one among fast developing occupational disease among population due to altered lifestyle, irregular body postures during work / physical activities etc. which is characterized by injuries to that particular site, associated with severe pain, tired feeling, stiffness, tingling etc. As per studies, 57% of working age adults reporting with Shoulder pain. Āyurvēda saṁhitā granthās explain such conditions in different orientation. Based on the guidelines mentioned in saṁhitās for understanding Anukta vyādhi, one can understand the RSI too. Trividha bodhya sangraha is one of unique orientation which is embedded in Nidanapancaka itself. Nidāna pañcaka is one among the mandatory criteria for any vyādhi. Here also same methodology followed to understand RSI in terms of Āyurvēda. It is proposed that RSI is to be understood as Vāta pradhāna Tridōṣa duṣṭi condition which mainly follows Samanya Vātavyādhi nidāna & Lakṣaṇas. In specific RSI can be appreciated in gata vāta Lakṣaṇas. Based on the involvement of nidāna, dōṣa, dushya, lakṣaṇa etc diagnosis of RSI can be made in Initial stages as Mamsa & Medhogata vāta. In Later stages as Asthi & Majjagata vāta.

Keywords: Repetitive stress injury, Anukta vyādhi, Nidāna pañcaka, Vātavyādhi, Gata vāta

Introduction

Repetitive strain injury (RSI) is an occupational disease that considerably impacts workers' lives and has significant socio-economic repercussions. The burden of RSI to people affected and the society are undeniably large. One third of workers' compensation costs in the US private industry are due to RSI, and the direct costs with compensation exceeds US\$ 20 billion in the Washington State alone ^[1].

Clinical, epidemiological and social aspects of RSI remain largely controversial in the medical literature. Nevertheless, RSI has been widely shown to affect a considerable proportion of the adult population and workers in all levels of economic activities. Certain occupational groups have an increased risk of developing RSI.

Repetitive strain injuries (RSI) can be defined as injuries caused or aggravated by repetitive or sustained submaximal exertion of the body's soft tissue structures including muscles, tendons, ligaments, and nerves ^[2]. RSI also called cumulative trauma disorder, repetitive motion injury, or work related musculoskeletal disorder.

In Āyurvēda saṁhitā granthās, understanding of new diseases like RSI was found in different orientation i.e. through the guidelines mentioned in saṁhitās for understanding Anukta vyādhi ^[3], one can understand the condition. To understand and appreciate the concept of anukta vyādhi, it is essential to consider basic concepts of Āyurvēda like dōṣa, dhātu, agni, srōtas, and so on. Though anukta vyādhi are not interpreted in terms of their names, the cluster of signs and symptoms and underlying pathology can be understood by the basic principles stated above which not only helpful in understanding the pathogenesis but also gives a direction to think in terms of treatment for the same.

Aim & objectives

To understand disease Repetitive stress injury in terms of Āyurvēda.

Material & Methods

Literary study of Repetitive stress injury was done from contemporary medical texts, various Āyurvēda texts, related

journals & Works.

Repetitive strain injury (RSI) in the light of Ayurveda Etiology^[4]

As per contemporary texts, aetiology of RSI can be appreciated in following divisions:

Table 1: Showing Etiological factors of RSI

Physical activities	Environmental factors and Psycho-social issues	Risk factors
Physical activities like sports, typing on a typewriter or a Computer Keyboard etc. generally involves a. Repetition b. Posture – placing a joint towards its extreme end of movement in any direction away from its neutral, centred position. c. Force d. Static Exertion e. Contact stress – direct pressure on nerves or tendons due to resting the body part against a hard & possibly angled surface.	<ul style="list-style-type: none"> ▪ Low levels of job satisfaction. ▪ Infrequent or inflexible breaks. ▪ Monotonous work. ▪ Limited autonomy. ▪ Perception of intensified workload and work pressure (deadlines, monitoring, bad management). ▪ Limited support from supervisors and co-workers. 	<ul style="list-style-type: none"> ▪ Diabetes ▪ Rheumatoid Arthritis ▪ Thyroid Disease ▪ Gout ▪ Obesity ▪ Hormone conditions (Pregnancy, Hysterectomy or removal of both ovaries) ▪ > Fluid retention (Pregnancy, Birth control and Sudden weight gain) ▪ Previous injuries ▪ Smoking and Alcohol

Probable correlation of Nidāna as per Āyurvēda

As per contemporary review, Nidāna of RSI are mainly due to improper / heavy physical activity & other components. These nidānas are highly seen in Vātavyādhi nidāna. i.e.

- Rūkṣa Āhara, Viṣamādupacāra, Vyāyāma Ativicēṣṭitaiḥ, Cintā-Sōka-Rōgātikarṣaṇāt, Duḥkhaśayyāsanāt, Bhayādapi, Vēgasandhāraṇāt, Āmāt, Abhigātāt, Marmāghātāt etc as per Caraka Saṁhitā^[5],
- Tiktōṣaṇa rasa pradhāna, Rūkṣa-Pramitabhōjanaiḥ, Kriyātiyōga, Abhīśōka-Cintā-Vyāyāma as per Aṣṭāṅgahṛdayam^[6] are the Nidānas mainly seen in RSI.

Apart from explaining the particular aetiological factors of every particular vyādhi, our ācāryas have identified three main hētus as being responsible for all sorts of diseases and ill health. They are "Asātmendriyārtha Saṁyōga, Prajñāparādha and Pariṇāma^[7]".

Asātmendriyārtha Saṁyōga

The human sense organs keep regular contact with the world outside so as to receive sensations relating to arthas or viśayas. This contact is expected to be conducive to the maintenance of svāsthya. Such a contact or yōga is called 'Samyak yōga' i.e., proper contact. When the contact is not proper then it is called 'Asātmendriyārtha Saṁyōga' or incompatible correlation of the senses with their objects. Here Indriya refers to both Jñānendriyas (Sense organs) and Karmendriyas (Motor organs).

There are three types of Asātmya Saṁyōgas^[8]

- a) Hīnayōga or Ayōga meaning negligible contact or no contact at all."
- b) Atiyōga means excessive contact.
- c) Mityayōga means contact of indriyās with vikṛta or unnatural viśayas.

Atiyōga and Mityayōga contribute very much for the causation of RSI.

- **Prajñāparādha:** Continous sevana of nidāna
- **Pariṇāma:** After ages, if Nidāna varjya not done means,

due to kālaprabhāva, Symptoms of contracture with permanent disability develops [Phase 3].

Premonitory symptoms of RSI

When physical activities become excessive to the point of injury, localized fatigue is usually the first sign of excessive strain to the body. Symptoms of localized fatigue are discomfort (aches and pains), loss of strength and trembling in the affected limbs. These symptoms tend to increase as the offending activity is continued and usually decrease or disappear within hours or minutes of stopping the task. In terms of Āyurveda, especially in vātavyādhi, pūrvarūpa is mentioned as 'avyakta'^[9]. Another possibility of considering avyakta is because of predominance of vāta dōṣa.

Symptoms of RSI**RSI develops in four phases^[10]**

- **Phase 1:** Starts with a tired feeling, stiffness, tingling in fingers, wrists and hands. Progressing into a nagging and sharp pain which disappears with rest.
- **Phase 2:** Problems do not disappear overnight, continuous light pain or nagging ache accompanying all daily activities. After a long period of rest, the pain goes away but returns easily when similar work is done.
- **Phase 3:** Pain is continuous often combined with reduced strength and less accurate control. At work the pain is intensified, when rested the pain remains. In serious cases patients wake up at night or cannot sleep because of pain.
- **Phase 4:** Symptoms of contracture with permanent disability develops.

There are three basic categories of RSI^[11]

1. **Repetitive Stress Injuries involving tendons, muscles and soft tissues:** Bursitis, Myositis, Rotator cuff tendonitis, tendonitis including "Tennis elbow" & "Golfer's elbow", Ganglion cysts, De Quervain's disease and trigger finger.
2. **Repetitive Stress Injuries involving nerves:** Carpal Tunnel Syndrome, Ulnar nerve compression at the elbow

and wrist.

3. Repetitive Stress Injuries involving the Vascular (Blood Vessel) System: Raynaud's Syndrome and Thoracic Outlet Syndrome. The following table gives information regarding the area affected, the type of tissue involved and the symptoms of diseases included under RSI.

Stages

- Stage I symptoms are seen only while at work and do not persist.
- Stage II symptoms persist but disappear with rest.
- Stage III symptoms are permanent.

Probable correlation of symptoms as per Āyurvēda

Symptoms of RSI which is seen textually & clinically among subjects are appreciated mainly in Sāmānya lakṣaṇas of vātavyādhi ^[12].

i.e.

Saṅkōcaḥ Parvaṇām, Stambhō Bhēdō'sthnām Parvaṇāmapī, Pāṇiprṣṭhaśirōgrahaḥ, Śōṣō Aṅgānām, Anidratā, Spandanām, Gātrasuptatā, Bhēda, Tōda, Arti, Ākṣēpa, Mōha, Āyāsa etc are the sāmānya lakṣaṇas which are correlated more towards symptoms of RSI. But depending upon Hētu & Sthāna Viśēṣa, specific & different vāta vyādhis will be produced. In specific, Lakṣaṇas of RSI are appreciated in Gata vāta lakṣaṇas explained in caraka & Sushruta Saṁhitā. These lakṣaṇas are appreciated in sequence as per involvement of uttarōttara dhātu. i.e.

Table 2: Lakṣaṇas of RSI appreciated in Gata Vāta lakṣaṇa ^[13]

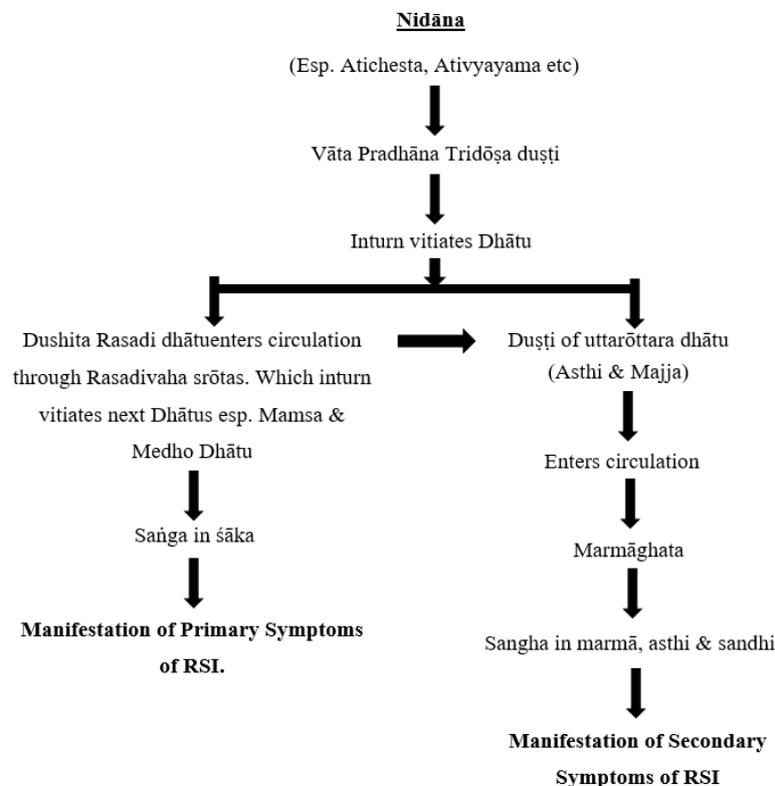
Sequence of Dhātu Involvement	Lakṣaṇas Observed
Tvak gata vāta	<ul style="list-style-type: none"> Supta & Parvaruk (C.S) Supti & Cumacumāyana (S.S)
Raktagata Vāta	<ul style="list-style-type: none"> Tivra Ruja & Stambha
Mamsa & Medhagata Vāta	<ul style="list-style-type: none"> Gurvaṅga, Ati tōda, Saruja & Śramitamatyartham (C.S) Saśūla, Ruja (S.S)
Majja-Asthigata Vāta	<ul style="list-style-type: none"> Bhēdō Asthiparvaṇām, Sandhiśūlam, Māmsabalakṣayaḥ, Asvapnaḥ & Santatā Ruk (C.S) Śūla, Śōpha (S.S) Majjagatē Ruk ca na Kadācit Prasāmyati (S.S)

Upaśaya & Anupaśaya

- Restraining from work showed mild benefits among observed subjects. Hence can be considered under **Upaśaya**.
- Continuous physical activity, stress etc factors mentioned as Nidāna can be considered under **Anupaśaya**.

Pathogenesis / Samprāpti

Vāta prakōpakara āhāra and vihāra causes the aggravation of vāta. The vitiated vāta travels throughout the body and finally settles in srōtas which are rikta i.e., srōtas which have become weak in quality resulting in the manifestation of Vātavyādhi. Further Caraka has classified the aetiological factors for the genesis of Vātavyādhi into two as (a) Dhātukṣaya and (b) Mārgavarodha.



Samprāpti Ghataka

Dōṣa: Vāta Pradhāna Tridōṣa

Dūṣya: Rasa-Rakta-Māmsa-Mēdha [Initially]

Asthi-Majja [Later]

Agni: Jātarāgni & Dhātāvāgnimāndhyajanya

Āma: Jātarāgni & Dhātāvāgnimāndhyajanya Āma

Srōtas: Rasa-Rakta-Māmsa-Mēdhovaha Srōtas [Initially]

Asthi-Majja Srōtas [Later]

Srōtoduṣṭi: Saṅga, Vimārgagamana

Udbhavasthāna: Kōṣṭha

Vyaktasthāna: Śāka [depends on Khavaigunyata]

Adhiṣṭāna: Śārīra & Manas

Rōgamārga: Bāhya & Ābhyantara, Madhyama

Śādhyāsādhyata: Sādhyā [Initially]

Kricra Sādhyā [Later]

Discussion

RSI is one among the highly crumbling occupational disorder among population. Proper understanding of disease is the mandatory criterion before attempting its cure. Hence discussion helps to connect the points between each component of review & gives allows reader to see connections between each component.

Discussion on Nidāna

Above mentioned nidānas can be categorized as follows for better analysis

Table 3: Categorization of vātavyādhi nidāna in RSI

Category	Nidāna
Āhāraja	<ul style="list-style-type: none"> Rūkṣa Āhara, Āmāt Tiktōṣaṇ rasa pradhāna, Rūkṣa-Pramitabhōjanaiḥ,
Vihāraja	<ul style="list-style-type: none"> Viśamādupacāra, Vyāyāma Ativicēṣṭitaiḥ, Vēgasandhāraṇāt, Duḥkhaśāyāsanāt Kriyātiyōga, Vyāyāma
Mānasika	<ul style="list-style-type: none"> Cintā-Śōka-Rōgātikaṣaṇāt Abhīśōka-Cintā
Others	<ul style="list-style-type: none"> Abhighātāt, Marmāghātāt

Among these Nidānas, Viśamāśana, Ativyāyāma, Aticēṣṭa & Abhighāta etc are having more tendency towards afflicting RSI.

Viśamāśana

Refers to improper sitting posture / on an uneven seat. In case of RSI, Viśamāśana plays important role. The person working on Typewriter & Computer continuously stay glued to their seats with sustained immobility with tense muscles in neck, shoulders, arms and wrists. This leads to the aggravation of vāta.

Ativyāyāma & Aticesta

Repetitive motions of the fingers on the keyboard increase Rūkṣa guṇa in the body by which dryness is seen in fingers. This is due to the vitiation of vāta.

Abhighāta

Repetitive motions of the fingers on the keyboard or the static pressure exerted on the mouse causes trauma to the underlying tissues. As the work is continued, there is no time given for the injured tissues to repair. This process continues over a long period and the trauma goes on adding up until the hands become very tired. This type of trauma vitiates vāta.

Marmābhigata

It is the causative factor for Vātavyādhi. On analyzing the job nature of a typist and a computer operator it is evident that the finger and hand movements are more among them. It is likely that the continuous and repetitive motions injure the Marmās of the hand.

There are five Marmās in the hand viz., Kṣipra, Kūrca, Kūrcaśira, Talahṛdaya & Maṇibandha. The first three are Snāyu marmā, fourth is māṁsa marmā and the last is Sandhi

marmā. Any grievous injury to Kṣipra and Talahṛdaya leads to Kālāntara Pranāhāra i.e., death after some period of time. Injury to Kūrca leads to Vaikalya i.e., deformity. Injury to Kūrcaśira and Maṇibandha causes severe ruja (pain). In case of moderate injury, ruja or pain will be the first symptom due to the aggravation of vāta followed by vikālata over long period of repetitive injury.

Discussion on Lakṣaṇas of RSI

Lakṣaṇas of vyādhi suggests vyakta & bhedha avasta of vyādhi. Here the lakṣhanas are highly specific & major Lakṣaṇas of RSI are appreciated in samanya Lakṣaṇas followed by gata vata Lakṣaṇas. This highlights application of Anukta vatavyādhi through RSI.

Discussion on Samprāpti of RSI

In case of RSI, by the continuous indulgence in vātakara āhāra and vihāra, Rūkṣata (roughness), riktata (weakness), laghutva (lightness) in srōtas is attained [Sancaya, Prakopa avasta]. When vāta reaches to such a place [Prasara avasta] or srōtas gets obstructed because of dōṣa (Kapha or pitta), dhatu etc saṅga of vata dōṣa takes place resulting in vimārgagamana [Sthanasamsraya avasta] & Vikruta karma resulting the condition favourable for genesis of Vātavyādhi [Vyakta avasta].

Gata vata is one of the unique feature observed in RSI. Based on level of dusti of dhatus, lakṣaṇas were appreciated at the level of samprāpti. Uttarottara dusti of dhatu were clearly observed through respective lakṣhanas.

Discussion on Components of Samprāpti Ghataka

- Dōṣa:** All Dōṣas are involved in the pathogenesis of RSI. Among that Vāta is pradhāna dōṣa involved. As aṅgamarda symptom is considered in terms of RSI, it is observed when there is vāta-Pitta Vṛddhi & Kapha Kṣaya & also when Vāta Vṛddhi, pitta sama & Kapha kṣaya lakṣaṇa [14]. Along with aṅgamarda other symptoms related to RSI also observed. Hence with this, one can infer Vāta pradhāna tridōṣa dūṣṭi in RSI.
- Dūṣya:** In RSI, dūṣya are mainly Rasa-Rakta-Māṁsa-Mēdha [Initially] & Asthi-Majja dhātu[Later]. As dūṣyas are those which gets vitiated by Dōṣa [ते च दूष्याः वातादिभिर्दोषैर्दूषणीयाः [15] -A.S.Su.1/18]. Hence based Pradhānata of Dōṣa & Lakṣaṇa in vyādhi, dūṣyas can be identified.

When Vruddha vāta Dōṣa enters Rasādi Dhātus, manifestation of lakṣaṇas with specific to dhātuin sequence will be observed. These lakṣaṇas are mainly depends on uttarōttara dhātudūṣṭi, which are evident in tvagaadi gata vāta lakṣaṇa.

- Agni:** Mandāgni is the mula kāraṇa for all vyādhi's. In case of RSI, Jātarāgni & Dhātāvāgni mandhya can be inferred.

Many of the lakṣaṇas related to RSI are even observed in sāmānya Ajirṇa lakṣaṇa. When ajirṇa gets associated with vāta, it gives rise to several vātika disorders & also when gets associated with rasādi dhātus it causes diseases of rasa etc dhātus [16].

This ajirṇa is mainly due to mandāgni. With the involvement of Dōṣas, Jātarāgni & with involvement of dhātu, Rasa-

Rakta-Māmsa-Mēdha [Initially], Asthi-Majja [Later] Dhātāvāgni can be inferred.

4. **Āma:** Āma is also one of the Samavāyi Kāraṇa which is involved in the pathogenesis of every disease. The first Dhātu by the weakness of Agni remaining undigested and becoming vitiated accumulates in the Āmāsaya is known as āma. Hence, there is no provision for separate consideration of ama other than Agni. Therefore, Rasa-Rakta-Māmsa-Mēdha [Initially], Asthi-Majja [Later] janita dhātugata āma can be inferred.
5. **Srōtas:** Rasa-Rakta-Māmsa-Mēdhovaha Srōtas [Initially], Asthi-Majja Srōtas [Later]. Acc. to gangadhara teeka, srōtases are those, through which transportation of rasādi dhātu takes place. As Dusta rasādivaha dhātu circulated in srōtases causes dūṣṭi in respective srōtases & lakṣaṇas are observed. Many of these lakṣaṇas are related to RSI. Hence with this, dūṣṭi of above mentioned srōtases can be inferred.
6. **Srōtōduṣṭi:** Saṅga & Vimārga gamana kind of srōtōduṣṭi can be inferred in RSI. Here saṅga can be considered in terms of dhātu duṣṭi. In case of RSI, due to repetitive injury to any region leads to rasa (tvak) duṣṭi, followed by uttarōttara dhātuduṣṭi.

Vimārgamana can be considered in terms of dōṣa esp. with vāta. It is only dōṣa having gati & responsible for carrying other two dōṣas, dhātus etc. dusta dhātus & ojas were carried by vāta all over the body & responsible for manifestation of Lakṣaṇas at the site of Khavaiguṇya.

7. **Udbhavasthāna:** As all three Dōṣas are involved in manifestation of vyādhi, involvement of Āmāsaya & Pakvāsaya in terms of kōṣṭha can be inferred.
8. **Vyaktasthāna:** Vitiated vātadi Dōṣas travels throughout the body and finally settles in srōtas which are rikta i.e., srōtas which have become weak in quality resulting in the manifestation of vyādhi. In case of RSI, śāka is the place where Khavaiguṇya takes place.
9. **Adhiṣṭāna:** In RSI, both Śārīrika & Mānasika nidānas & lakṣaṇas are seen. Hence both Śārīra & Manas can be inferred as adhiṣṭāna.
10. **Rōgamārga:** In RSI, all 3 rōga mārga i.e., Bāhya, Ābhyantara & Madhyama can be inferred.
 - It is observed that among computer users & sport persons, the continuous and repetitive motions injure the Marmās of the hand. With this one can infer involvement of Bāhya rōga mārga.
 - With involvement of Kōṣṭha as udbhavasthana, abhyantara rōga mārga can be inferred.
 - As the disease progresses, there will be involvement of Marmā, Asthi & Sandhi. Hence Involvement of Madhyama rōga mārga can be inferred.

11. Sadhyāsādhyata

Vātavvyādhi is a maharōga and is said to be duścikitsya. Yōgaratnākara says that Vātavvyādhi is asādhyā, but sometimes due to daiva yōga it gets cured. But there is always a doubt of cure to the physician. In Mādhava Nidāna it is said that if patient is healthy and without any complications then the patient should be treated, as it is Sādhyā for cikitsā. Susruta and Mādhavakara say that Suddha vātaja rōga is KrichraSādhyā, Dhātu kṣaya janya is asādhyā, and Pitta and Kaphānubandhi are Sādhyā. Bhāvaprakaśa, Vāgbhata and Yōgaratnākara opine the same. Repetitive Stress Injury as per Āyurvēda, shown involvement

of Tvacā, Rakta, Mamsa, Medha initially and in later stages Asthi and Majja. This is purely an occupational disorder and hence nidāna parivarjana plays an important role. In the absence of this it becomes krichrasādhyā, as it is śuddha vātaja rōga.

Vyādhi Vinischaya

As RSI is a new disease to Āyurveda, complete comparison of Disease itself and drawing conclusion is always not possible. With the above information, probable diagnosis can be done. i.e., RSI can be inferred as a type of Vāta vyādhi. In specific it can be taken as Gata vāta based on involvement of uttarōttara dhātu.

- **Initial stage:** Mamsa & Medhogata vāta
- **Later stages:** Asthi & Majjagata vāta.

Conclusion

RSI is one among the debilitation Occupational diseases among population due to deranged life style & activities. Even though there is no direct mentioning of disease as such but through the guidelines mentioned in classical Ayurveda texts for understanding anukta vyadhi, made uncomplicated for further management. Nidāna, dōṣa, dushya, lakṣaṇa, and so on factors plays major role in understanding Vyādhi at primary level. Based on that one can consider / diagnose RSI in **Initial stages** as Mamsa & Medhogata vāta. In **Later stages** as Asthi & Majjagata vāta.

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