



Case Study

## A CASE REPORT ON THE MANAGEMENT OF ASTHIKSHAYA (NUTRITIONAL RICKETS) BY AYURVEDA AND YOGA

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### ABSTRACT


Rickets is a disorder of growing bone due to abnormal mineralisation of bone. It affects longer bones, leading to poor bone growth and bony deformities such as bow legs and knock-knees in children. No direct description of such disease has been found in Ayurveda; the clinical manifestations due to *Asthikshaya* (deficient bony tissue) can be considered as rickets. Despite conventional treatment of supplementation of deficient nutrients, many children do not show satisfactory response to the treatment. This is a case report of nutritional rickets in a 3.5-year-old boy who presented with leg pain, cramps and frequent falls due to knocking of knees for the last four months. He was treated with the combined principles of Ayurveda and Yoga. The patient was treated with oral drugs like *Ashwagandhadi Churna*, *Kukkutandatwaka Bhasma*, *Godanti Bhasma*, *Muktashukti Bhasma*, *Lakshadi guggulu*, *Gandha Tail*, *Tiktaksheer Basti* (medicated enema), *Sthanika Snehan-Swedana* (local oleation and sudation), *Gatravestana* (bandaging), knee braces, and practice of *Yogasana* like *Tadasana* (standing pose), *Vrikshasana* (tree pose), *Utkatasana* (chair pose), and *Bhadrasana* (butterfly pose). The symptoms were relieved, the biochemical parameters were improved and no further bending of lower limbs was observed. Thus, the patient of nutritional rickets was treated with Ayurveda and Yoga.

### INTRODUCTION

Rickets is a disorder of growing bone characterized by abnormal serum calcium and phosphate levels that may cause the development of abnormalities in chondrocytes' differentiation and maturation and, consequently, defective mineralisation of the growth plate.<sup>[1]</sup> It predominantly affects longer bones, leading to poor bone growth and bony deformities such as bow legs and knock-knees.<sup>[2]</sup> Physiological Genu varum persists till twenty-four months of age, then gradually valgus is seen and adult alignment is achieved by the age of seven years. Nutritional rickets (NR) is the most common type and

most frequent cause of pediatric bone disease in the world. The main causes of NR are deficient intakes of vitamin D and/or calcium, or defect in the metabolism of these nutrients.<sup>[3]</sup> Vitamin D deficiency is the most common cause of NR, especially in temperate countries.<sup>[4]</sup> There is no exact clinical entity mentioned in Ayurveda classics like rickets but it can be considered as *Asthikshaya* (deficient bony tissue) because there is a depletion of *Asthi Dhatu* (bone) and vitiation of *Vata* causing delayed mineralisation and defective remodelling of bone.

Here, we report a case of Vitamin D deficiency nutritional rickets manifested as Genu Valgum. The patient came with his parents in the hospital for the treatment of pain and other symptoms. The case was managed by Ayurvedic principles and the treatment was aimed to enhance *Agni* (digestive fire) for proper absorption and assimilation of nutrients; nourishment of *Asthi Dhatu* by *Tikta Ksheera Basti*; strengthen *Mamsa Dhatu* (muscle) by *Bahya Snehana* (external oleation) and *Swedana* (sudation). *Gatravestana*

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(bandaging), knee support braces, *Yogasana* were practised to avoid further bending of the knees.

**Patient Information**

A 3.5 year-old male child reported to the outpatient department with his parents on 08 December 2022, with chief complaints of bilateral deformity of the lower limb, frequent falls due to bending of lower limbs and knocking at the level of the knee joint from the last four months.

**Symptoms**

According to the mother, she observed falls during rapid walking or running due to the bending of legs and knocking of knees. The child complained of pain in his legs during night time and had disturbed sleep. The pain was bilateral, insidious in onset, progressive in nature, not associated with numbness, not radiating to extremities and relieved shortly by any oil application and massage.

**Medical History**

The boy was born full term, appropriate for gestational age by normal vaginal delivery with spontaneous cry at hospital. He is the first child of her parents from a non-consanguineous marriage. His neonatal period went uneventful with normal developmental mile stones. He was exclusively breastfed up to two years of age, without vitamin D supplementation. He was vaccinated appropriate up to the age and had no known allergies. There is no family history of similar condition. There is no any family history of minor or major congenital anomaly. In the beginning the parents went to local pharmacist and dispensaries to get medicines for pain relief, gradually on worsening of the symptoms they consulted Homeopathic, Physiotherapy, Orthopaedic and Neurosurgery specialist and was diagnosed with Deficiency Rickets manifested as Genu Valgum. Oral supplementation of vitamin D and calcium was administered and symptomatic treatment was given for approximately two months but the pain persisted even after the treatment.

**Clinical Findings**

On examination, vital signs and higher mental functions appear normal. Upon the first visit to the OPD at an age of about 3 years, the child’s weight was 14kg (50<sup>th</sup> weight for age percentile), height was 99cm (85<sup>th</sup> length for age percentile), and head

circumference was 49cm (35<sup>th</sup> head circumference for age percentile), which all fall between the 5<sup>th</sup> to 90<sup>th</sup> centile. He had achieved developmental milestones according to the age but he could not walk or run very fast and fall due to knocking at knee joint. He does not have any difficulty in standing up from recumbent position. The knocking of knees and bending of the legs [Image 1] was observed, Harrison sulcus and Rachitic rosary were not visible. The intermalleolar distance was 12 cm, the tibiofemoral angle (TFA) of left knee was 12° and right knee was 10°. Asymmetrical bending, although minor was the matter of concern as asymmetry is always pathological. No Limb-to-limb discrepancy (LLD) was seen. Cardiorespiratory and neuromuscular examinations, discovered no significant findings and was found normal.

**Diagnostic Assessment**

Assessment of complaints together with the interpretation of blood investigations and radiological findings diagnosed the case as Nutritional Vitamin D Deficiency Rickets. Initial blood tests revealed elevated alkaline phosphatase (231 U/L; normal range (n): 30-90), serum phosphate (5.4mg/dl; n: 2.7-4.5), serum calcium (10.82mg/dl; n: 8.6-10), and deficient 25-hydroxy vitamin D levels (20.24ng/ml; n: 30-100); haemoglobin level was also decreased (08.1g/dl; n: 13-17). X-ray long length imaging of bilateral lower limb AP view suggested mild genu valgus deformity, with no shortening of long bones, and no evidence of erosion, destruction or metabolic bone disease.

**Therapeutic Interventions**

The patient was thoroughly examined in the OPD, and advised to oral intake of Syrup Boniheal for one week, along with proper counselling for sun exposure, proper diet and IPD admission for *Basti* and other external procedures. After one week the patient was admitted to the IPD. He was discharged after 14 days of IPD treatment and advised for oral medicine, *Yogasana* and follow-up. The patient was again admitted after two months and prolonged medication and procedure was done for two and half months. After discharge from the hospital telephonic follow-ups were taken regularly for oral medicines and *Yogasana* practice. The timeline of interventions is given below [Table 1].

**Table 1: Therapeutic interventions**

	Interventions
08/12/2022 (OPD Visit)	Internal/Oral 1. Syrup. Boniheal 5ml twice daily
15/12/2022 (IPD Admission)	Internal/Oral 1. <i>Ashwagandhadi Churna</i> -1gm

	<p>Twice daily processed with milk.</p> <ol style="list-style-type: none"> <li>2. Tab. <i>Lakshadi Guggulu</i> 1 tab once daily with water</li> <li>3. <i>Chitrakadi Vati</i> 1/2 tab once daily with water</li> <li>4. Syrup. <i>Boniheal</i> 5ml twice daily</li> </ol> <p><b>Procedures</b></p> <ol style="list-style-type: none"> <li>1. <i>Sthanika Snehana</i> with <i>Mahamasha Taila</i> for 20 mins</li> <li>2. <i>Nadi Swedana</i> with <i>Dashmoola Kashaya</i> for 10 mins.</li> <li>3. <i>Matrabasti</i> with 10ml <i>Mahanarayan Tail</i> for 3 days, followed by <i>Tikta Ksheera Basti</i> 90ml for 8 days.</li> <li>4. Followed by <i>Gatravestana</i> (bandaging) with <i>Snigdha-Ushna Erandapatra</i></li> <li>5. Knee support braces.</li> <li>6. <i>Yogasana: Tadasana</i> (standing pose), <i>Vrikshasana</i> (tree pose), <i>Utkatasana</i> (chair pose), <i>Bhadrasana</i> (butterfly pose)</li> </ol>
28.12.2022 (Advice & Discharge)	<p><b>Internal/Oral</b></p> <ol style="list-style-type: none"> <li>1. A combination of <i>Ashwagandhadi Churna</i> 500mg, <i>Kukkutandatwaka Bhasma</i> 125mg, <i>Godanti Bhasma</i> 125mg, <i>Muktashukti</i> 60mg in two divided doses with honey for two weeks.</li> <li>2. <i>Chitrakadi Vati</i> 1/2 tab once daily with water.</li> <li>3. Drop <i>Gandha Tail</i> 3 drops once daily with milk.</li> </ol> <p><i>Yogasana</i> advised: same as above</p>
16.03.2023 (IPD admission)	<p><b>Internal/ Oral</b></p> <ol style="list-style-type: none"> <li>1. A combination of <i>Ashwagandhadi Churna</i> 500mg, <i>Kukkutandatwaka Bhasma</i> 125mg, <i>Godanti Bhasma</i> 125mg, <i>Muktashukti</i> 60mg in two divided doses with honey for two weeks.</li> <li>2. <i>Chitrakadi Vati</i> 1/2 tab once daily with water.</li> <li>3. Drop <i>Gandha Tail</i> 3 drops once daily with milk.</li> </ol> <p><b>Procedures</b></p> <ol style="list-style-type: none"> <li>1. <i>Sthanika Snehana</i> with <i>Mahamasha Taila</i> for 20 mins</li> <li>2. Followed by <i>Nadi Swedana</i> with <i>Dashmoola Kashaya</i> for 10 mins</li> <li>3. <i>Matrabasti</i> with 10ml <i>Mahanarayan Tail</i> for 8 days, followed by <i>Tikta Ksheera Basti</i> 90ml for 16 days.</li> <li>4. Knee support braces.</li> <li>5. <i>Yogasana: Tadasana</i> (standing pose), <i>Vrikshasana</i> (tree pose), <i>Utkatasana</i> (chair pose), <i>Bhadrasana</i> (butterfly pose)</li> </ol>
09/04/2023 (IPD)	<p>Internal/Oral: Same as above</p> <p>Procedures: <i>Basti</i> stopped rest same as above</p>
16/04/23 (IPD)	<p><b>Internal/Oral:</b> Same as above</p> <p><b>Procedures</b></p> <ol style="list-style-type: none"> <li>1. <i>Tikta Ksheera Basti</i> 90ml for 16 days</li> <li>2. Rest same as above</li> </ol>
02/05/23 (Advice & Discharge)	<p><b>Internal/Oral: Advised for 2 months</b></p> <ol style="list-style-type: none"> <li>1. A combination of <i>Ashwagandhadi Churna</i> 500mg, <i>Kukkutandatwaka Bhasma</i> 125mg, <i>Godanti Bhasma</i> 125mg, <i>Muktashukti</i> 60mg in two divided doses with honey.</li> <li>2. <i>Chitrakadi Vati</i> 1/2 tab once daily with water.</li> </ol> <p><i>Yogasana: Tadasana</i> (standing pose), <i>Vrikshasana</i> (tree pose), <i>Utkatasana</i> (chair pose), <i>Bhadrasana</i> (butterfly pose) daily for 10 minutes in morning and evening.</p>

Follow- Up (Telephonic: Twice per month for subsequent months)	Advised for proper nutritious diet, sun exposure, oil application, massage and <i>Yogasana</i> practice as mentioned earlier.
21/12/2023 (OPD Visit)	Thorough physical examination was done and advised for proper nutritious diet, sun exposure, oil application, massage and <i>Yogasana</i> practice.

### Follow-up and Outcome

The patient was assessed through clinical examinations. Assessment of symptoms was done before and after the treatment. The tibio-femoral angle (TFA) was measured with the help of goniometer before and after treatment. At the end of the treatment, significant improvement was noted in clinical features in terms of limb pain, frequency of falls, bending of knees. No further bending was observed during and after the treatment as confirmed by measurement of TFA. The results of biochemical investigations before and after completion of treatment are summarized in Table 2.

**Table 2: Laboratory finding before and after treatment**

Parameter	Before treatment	After treatment
WBC	10.50 X 10 <sup>3</sup> / μL	07.50 X 10 <sup>3</sup> / μL
Hemoglobin	08.10 g/dl (n: 13-17 g/dl)	09.00 g/dl (n: 13-17 g/dl)
Vit D (25OH)	20.24 ng/ml (n: 30-100 ng/ml)	47.36 ng/ml (n: 30-100 ng/ml)
Sr. Calcium	10.82 mg/dl (n: 8.6-10 mg/dl)	08.60 mg/dl (n: 8.6-10 mg/dl)
Phosphorus	05.40 mg/dl (n: 2.7-4.5 mg/dl)	-

### FIGURES



**Image 1: Showing knocking of knees and bending of the legs**



**Image 2: Showing Tiktaksheera Basti drugs**



**Image 3: Showing Gatravestana with Snigdha-ushna Eranda Patr**

### DISCUSSION

*Adhyasthi* (formation of bone beneath the bony surface) is a feature of *Dushita Asthi Roga* (disease of vitiated bone).<sup>[5]</sup> In rickets, there is accumulation of unmineralized matrix on microscopic bony surfaces due to improper bone matrix formation and delayed mineralization. The bone loses its stiffness leading to bowing or knocking of lower limb in growing children. Deficiency of nutrients like vitamin D, and calcium can be considered as *Dhatukshaya* and raised levels of enzyme alkaline phosphatase is due to malfunctioning of *Agni* (metabolism). Depletion of *Dhatu* (tissue) causes aggravation of *Vata* leading to cramping and pain symptoms. So, principles of treatment of *Asthiashraya Vyadhi* (bony disorders) and *Vata Vyadhi*

(*Vata* disorder) are applied for the treatment.<sup>[6,7]</sup> *Basti* pacify vitiated *Vata* and nourish *Asthi Dhatu*. *Asthitoda* (bony pain) and *Asthisoushira* (porous bone) are the features mentioned in *Asthikshaya* and *Majjakshaya* respectively.<sup>[8]</sup> Both these conditions can be considered as stages of rickets, first stage manifesting as symptoms like bony pain and later stage in the form of unmineralized bone matrix resulting into the formation of porous bone. *Tikta Ksheerabasti* (medicated enema) is indicated in *Asthikshaya*.<sup>[9]</sup> Also, *Tikta Rasa* (bitter taste) is indicated in the treatment of *Asthi-Majjakshaya*. Decoction prepared by *Tikta Rasa* (bitter taste) herbs like *Vasa* (*Adhatoda vasica*), *Nimba* (*Azadirachta indica*), *Patola* (*Trichosanthes dioica*),

*Guduchi* (*Tinospora cordifolia*), *Kantakari* (*Solanum surattense*) was selected (6gm each, total 30gm) and *Basti* (90ml) was prepared with honey (10ml), rock salt (1gm), *Panchatikta Ghrita* (20ml), *Tikta Ksheer kashaya* (50ml), and *Saunf kalka/paste* (10gm) [Image 2]. *Basti* was prepared as mentioned in the context of *Niruhabasti*<sup>[10]</sup> and the dose was decided as per age, that is 1.5 *Prasrita* (120ml including 30gm *Tikta* dry herbs) for 3 years old child.<sup>[11]</sup> Oral drugs like *Ashwagandhadi Churna*<sup>[12]</sup>, *Kukkutandatwaka Bhasma*<sup>[13]</sup>, *Godanti Bhasma*<sup>[14]</sup>, *Muktashukti Bhasm*<sup>[15]</sup>, helps in nourishment of tissue and restoration of bone mineral deficiency. *Lakshadi guggulu* is indicated in bone-related problems and contains *Laksha* (*Laccifer lacca*), *Asthishrinkhala* (*Cissus quadrangularis*), *Ashwagandha* (*Withania somnifera*), *Gangeruka* (*Grewia populifolia*), *Shuddha guggulu* (purified *Commiphora mukul*).<sup>[16]</sup> It is rich in calcium, fasten healing in bone fracture, pacify joint pain and has antiarthritic and chondroprotective activity.<sup>[17]</sup> *Gandha Tail* possesses properties like *Vatahara* (*Vata* pacifier), *Bhringhana* (nourishment), *Asthidhatu vardhaka* (nutrient enhancer) and *Sthairyakrit* (provide compactness and stability to bone).<sup>[18]</sup> Doses of all these drugs are advised, considering the state of depleted *Asthi Dhatu* caused due to deranged *Asthidhatwagni*.

*Sthanika Snehana* (localised external oleation) with *Mahamasha* oil and *Nadi Swedana* (pipe sudation) with *Dashmool* decoction was performed. *Mahamasha* Oil is *Vatahara* and increases the strength of muscle.<sup>[19]</sup> Together with the compactness of bone and strengthening of muscle, the knocking was supposed to be checked with no further increase of deformity. Along with oral medication, *Snehana*, *Swedan* and *Basti* therapy, *Gatravestana* (bandaging) with *Snigdha-Ushna* (unctuous and warm) *Erandapatra* (leaves of *Ricinus communis*) [Image 3] and knee support braces are applied. *Vestana* is mentioned in the treatment principle of *Vata Vyadhi*, bandaging of lower limbs with *Vatahara Erandapatra* relieves the acute pain and cramping by alleviating *Vata dosha*. Yogic practices at regular basis are included in the treatment in a playful way. The child was made to practice *Yogasana* like *Tadasana* (standing pose), *Vrikshasana* (tree pose), *Utkatasana* (chair pose), *Bhadrasana* (butterfly pose) to enhance strength, maintain the flexibility of muscles and movement of joints. Child was made to perform asana for a short duration without the breath holding practices (*Kumbhaka*). Practising Yoga in children can help improve flexibility, strengthen muscles and improve balance. It consists of gentle stretches, and movements, often mimicking animals and things surrounding them. Extreme forward and backward bending, overstretching or being pushed too hard

while practising was avoided. Knee extension occurs during performance of *Tadasana* and *Vrikshasana*. During knee extension, the posterior compartment of thigh is stretched and to sustain this extension, the knee undergoes active contraction. In *Vrikshasana*, one knee is lifted and the foot is placed on the inner thigh above the knee of the standing leg; muscles in the torso and the raised thigh balance the leg by rotating the knee outward.<sup>[20]</sup> *Utkatasana* strengthens the hips, thigh muscles, and joints of the lower limb, and stabilizes knees and ankles by strengthening the quadriceps, hip flexors, psoas, pectineus, rectus femoris, and sartorius, which hold the femurs in a fixed position. *Bhadrasana* stretches the knees and increases blood circulation in the legs.<sup>[21]</sup> Regular practice of *Yogasana* increases strength, bulk and blood circulation of muscles.

## CONCLUSION

NR has become a health concern in children. Although it is preventable; unnoticed or non-compliant severe deficiencies leads to irreversible bone deformity and other complications in later life. Despite oral supplementation of minerals and vitamin D, many children do not show rise in the serum level of these nutrients. In this case report a combined approach based on the principles of Ayurveda had relieved the patient from acute symptoms, also *Yogasana* practice was found beneficial as maintenance therapy and can be adopted as preventive procedure for prevention of knocking and bending deformity following nutritional deficiency in children.

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