An Observational Cross-sectional Single Arm Trial and Perspective Study of Siddha Diagnostic Tool Neerkuri and Neikuri (Uroscopy) in COVID-19 Patients

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Authors’ contributions
This work was carried out in collaboration among all authors. Author JJ did conceptualization, performed methodology, wrote, reviewed and edited the study protocol and software development of the manuscript. Author SRR interpreted and discussed the study. Author PS did data curation and supervised the study. Author PMB worked as a project administrator, helped in data visualization and investigation. Author RSP wrote and prepared the original draft, did data validation, formal analysis and data curation of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aim: Siddha diagnostic method neerkuri includes the visual observation of urine directly or by adding one drop of gingelly oil on the urine surface. The study is an effort to understand the non-invasive affordable Siddha method of identifying pathological disorders, which may be used for

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both diagnostic and prognostic purposes in COVID cases. The present aim is to observe the changes in the urine before and after the Siddha fixed treatment regimen and validate the effectiveness of neerkuri-neikuri urine test mentioned in Siddha texts.

**Presentation of Case:** This study was conducted among ten patients with SARS-CoV2 infection admitted in Kokila Siddha Hospital and Research Centre, COVID-ward. They underwent modern tests as well as Siddha diagnostic test neerkuri-neikuri and the results interpreted. For adequate assessment, the entire procedure was captured in the form of video clips.

**Discussion:** The foundation of neerkuri-neikuri is one of the Envagaiuthervu (Eight-fold assessment) of Siddha diagnosis based on three humor theory, fundamental physiology and it alter with specific infection. The neerkuri-neikuri tests are rational criteria that are comprehensive to understand one’s health and illness status based on Siddha physiopathology.

**Conclusion:** After the administration of the Siddha intervention, the neerkuri-neikuri test results also showed good improvement along the clinical symptoms and modern laboratory parameters of patient tests. The prognostic clinical findings and modern test results were also simultaneously reflected in the neerkuri-neikuri tests. After the completion of Siddha treatment, the neikuri patterns also reached single kabha humor in muthu (pearl), vatya humor in aravu(snake) and sangu (conch-shell) patterns from three humor state, which indicated a good prognosis.

**Keywords:** Neerkuri; neikuri; COVID-19; Therayar.

### 1. INTRODUCTION

Urine is a liquid by-product of the body that is ejected through the urethra after being secreted by the kidneys through urination. A urinalysis (often called a urine test) evaluates the visual, chemical, and microscopic features of the urine. In modern science, urinalysis has become a routine test procedure to diagnose any disease like Urinary tract infection, diabetes, kidney diseases etc., and to know the prognosis [1].

This method of examination was performed by Greek physicians as far back as 500 BC in ill patients. Medieval European physicians began performing the procedure regularly and documenting their findings. 7000 years before the time of saint Agathiar, the saint Therayar wrote about the visual quantitative and qualitative properties of urine, the neerkuri (visual urine analysis) and the reaction of gingelly oil on the surface of the urine, the neikuri (oil-urine test analysis) one of the prime diagnostic procedures in Siddha medicine. Siddha’s philosophy holds that urine is composed of appu bhutham (water element), just like blood, semen, fat and bone marrow [2]. Siruneerkuri Sothanai, Therayar Neerkuri Vaithyam and Sarabendr Siddha Maruthuva Sudar are popular manuscripts cum books that describe the findings of urine examinations for diagnostic and prognosis purposes [3-5]. Sage Therayar made a substantial contribution to Siddha's diagnosis and therapy methods [6]. Neerkuri's general observations include Niram (Color), Nirai (Density), Naatram (Odour), Nurali (Froth), and Enjal (Volume / time). The good or poor prognosis of numerous diseases is assessed by the neikuri test [7]. According to Siddha medicine, COVID-19 could be compared with Kabasuram [8].

### 2. AIM

To evaluate the diagnosis and prognosis of Kabasuram (COVID-19) using one of the Siddha diagnostic methods Neerkuri- neikuri analysis.

### 3. OBJECTIVES

#### 3.1 Primary Objective

To study the prognosis of Kabasuram with Siddha diagnostic methods such as neerkuri-neikuri and compare it with modern diagnostic methods.

#### 3.2 Secondary Objectives

Observing the changes of neerkuri and neikuri after the intake of Siddha medication and studying the different patterns of neikuri to compare them before and after the administration of Siddha intervention.

### 4. MATERIALS AND METHODS

#### 4.1 Study Design

This is an Observational Cross-Sectional Study Single Arm Trial. The study was carried out to assess outcomes of Siddha diagnostic methods...
like neerkuri-neikuri results with modern diagnostic methods in COVID-19 patients.

4.2 Sample Size

Ten (10) patients with laboratory-confirmed diagnosis of coronavirus (SARS-CoV2) infection had been involved in the study. The patients were admitted to the Covid ward, Kokila Siddha Hospital and Research Centre, Madurai.

4.3 Inclusion Criteria

- All patients included in this study were diagnosed with COVID-19 based on the World Health Organization (WHO) guidelines those who had an influenza-like illness and were SARS-CoV-2 Reverse transcription-polymerase chain reaction (RT-PCR) positive in a throat swab.
- Both male and female.
- belonging to age 12 years and above.
- Willing to participate in the study.

4.4 Exclusion Criteria

- Age below 12 years and above 70 years.
- Having HT or DM, Bronchial asthma, CKD or liver diseases.
- Female patients on DUB or menstrual days during the study.
- Not willing to test their urine.
- Patients taking essential modern medicines for their existing illness.

4.5 Procedure

At the time of admission, the selected subjects were started with Siddha treatment and investigated using both modern and Siddha tests at the time of admission, every 5 days after starting Siddha intervention until they were discharged [9,10].

4.5.1 Modern tests

RT-PCR test, CT scan (lung), FBS or PPBS or RBS, serum urea, serum creatinine and liver function test were done at the time of admission. COVID markers ferritin, LDH, D-Dimer and CRP were done for prognosis during admission and also before discharge.

4.5.2 Neerkuri / neikuri test

According to neerkuri the niram is color, nurai is froth, enjal is volume/time per day, they were recorded. Neikuri deals with the various reactions like floating, spreading, drowning, splitting, mingling, shaping, bubbling, dips and hikes appearing, whirling, disappearing, boiling, immersion, dispersion, movement and stability of the oil drop which is instilled in the urine surface. It was carefully observed from the time of instilling to till the time it becomes disappear or no reaction. The test results obtained from neerkuri-neikuri were used for the interpretation of vali, azhal and iyam humor and their differentiation, diagnosis, good or poor prognosis and the sequel of diseases.

4.5.3 Siddha intervention

The Siddha drugs given to the patients are mentioned in Table 1.

4.5.4 Diet and siddha drug regimen

The following table (Table 2) consists of the diet and drug followed for the covid patients during the hospital stay.

### Table 1. List of siddha drugs

<table>
<thead>
<tr>
<th>Name</th>
<th>Duration</th>
<th>Formula</th>
<th>Dose &amp; Anupanam (Adjuvant)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thaleesadi chumam</td>
<td>5-14 days</td>
<td><em>Agasthiyar ratnachurukkom</em></td>
<td>1 gram with hot water, three times in a day after food</td>
</tr>
<tr>
<td>Nialvembu Kudineer</td>
<td>5-14 days</td>
<td><em>Siddha vaidya thirattu</em></td>
<td>60 ml, once in a day, before food</td>
</tr>
<tr>
<td>Vasantha kusumakaram mathirai</td>
<td>5-7 days</td>
<td><em>Siddha vaidya thirattu</em></td>
<td>100 mg, twice in a day after food</td>
</tr>
<tr>
<td>Brahmamanda bairavam mathirai</td>
<td>5-7 days</td>
<td><em>Siddha vaidya thirattu</em></td>
<td>100 mg, twice in a day after food</td>
</tr>
<tr>
<td>Kasthuri karuppu</td>
<td>5-7 days</td>
<td><em>Siddha vaidya thirattu</em></td>
<td>50 mg, twice in a day after food</td>
</tr>
<tr>
<td>Adathodai manappagu</td>
<td>5-14 days</td>
<td><em>Siddha vaidya thirattu</em></td>
<td>10 ml with hot water, twice in a day after food</td>
</tr>
<tr>
<td>Swasa Kudori mathirai</td>
<td>5-14 days</td>
<td><em>Siddha vaidya thirattu</em></td>
<td>100 mg, twice in a day after food</td>
</tr>
</tbody>
</table>
5. OBSERVATION AND RESULTS

5.1 Signs and Symptoms

The common signs and symptoms of cough, anorexia, mild dyspnea, malaise, fever, diarrhea, vomiting and headache were observed and noted. The common signs and symptoms before and after Siddha treatment of the patients who have been selected for the study have shown in Table 4.

5.2 Blood Bio-chemical Parameters

RT-PCR or CT-chest has been used for the initial diagnosis of COVID-19 along with biochemical tests like Ferritin, LDH, D-Dimer and CRP have also been recorded at the time of admission, every 5 days of Siddha treatment and before discharge. The test results of COVID markers in Table 3 and Fig. 1 showed significant improvement of Siddha intervention.

5.3 Siddha Neerkuri / Neikuri Parameters

The urine sample was analyzed as mentioned by Siddhar Therayar in the text Siruneerkuri Sothanai [4]. In this study we could able to find Niaram (color), Nurai (froth), Enjal (Deficiency / Frequency) and Satthu (Deposits/Essence), but could not able to analyze Edai (Weight) and Manam (Odour). At the time of discharge there was no notable difference observed in the niram (color) except the red color urine became yellow in 2 cases (20%) before discharge. Nurai/Satthu (froth/sediments) showed significant reduction and enjal (frequency) showed some increase in frequency urination at the time of discharge. Most of the samples in neikuri test had Kanthuru/Thandikkai (nape of the neck/Bellerica-fruit) Salladaikan (sieve-filter), Moozhgiyanilai (sunken), Kabhakalappu (kabba union) and Methuvatta paraval (slow spread & circle) which denoted Kabham, Kabhavatham, Sannivatham and Sanni at the time of admission. After Siddha intervention all the samples showed single kabha humor in Muthu (Pearl), vatha humor in Aravu (snake) and Sangu (Conch-shell) patterns which denoted good prognosis (Fig. 2).

5.4 Diagnostic and Prognostic Signs / Symptoms

The common signs and symptoms, the modern and Siddha diagnostic and prognostic test results before and after Siddha treatment were noted in Table 4.

Table 2. Diet and siddha drug regimen

<table>
<thead>
<tr>
<th>Time</th>
<th>Diet and drug</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.30 am</td>
<td>Vazhalai Vaanguthal and Yoga</td>
</tr>
<tr>
<td>7.00 am</td>
<td>vedhu (steam inhalation) and otrada pottani (bundle fomentation) using Notchi</td>
</tr>
<tr>
<td>7.30 am</td>
<td>Nilavembu kudineer</td>
</tr>
<tr>
<td>8.00 am</td>
<td>Idiappam or Idli</td>
</tr>
<tr>
<td>8.30 pm</td>
<td>Brammanantha bairava matthirai, Adhathodai manapagu, Thaleesadhi chooranam,</td>
</tr>
<tr>
<td></td>
<td>Swasakudori mathirai</td>
</tr>
<tr>
<td>10.30 am</td>
<td>Fruit Juice or Salad</td>
</tr>
<tr>
<td>12.00 noon</td>
<td>Chukku Decoction + Peyan or Sirumalai vazhalpazham (banana)</td>
</tr>
<tr>
<td>1.30 pm</td>
<td>Rice or Karunkuru vai or Barley Kanji with pepper gravy and pepper rasam or</td>
</tr>
<tr>
<td></td>
<td>panchamuti kanji or chukku mudichu kanji</td>
</tr>
<tr>
<td>2.00 pm</td>
<td>Vasanthakusumagaram mathirai</td>
</tr>
<tr>
<td>3.00 pm</td>
<td>Vegetable Juice or Soup</td>
</tr>
<tr>
<td>5.00 pm</td>
<td>Paruppu sundal (boiled lentils)</td>
</tr>
<tr>
<td>6.00 pm</td>
<td>Kabhasura kudineer</td>
</tr>
<tr>
<td>7.00 pm</td>
<td>Idli or Utthappam (without oil)</td>
</tr>
<tr>
<td>7.30 pm</td>
<td>Brammanantha bairava matthirai, Adhathodai manapagu, Thaleesadhi chooranam,</td>
</tr>
<tr>
<td></td>
<td>Swasakudori mathirai, Kasthuri karuppu</td>
</tr>
<tr>
<td>8.00 pm</td>
<td>Thiripala churanam or Asta churanam 2 gram with hot water</td>
</tr>
</tbody>
</table>
Table 3. COVID markers at the time of admission

<table>
<thead>
<tr>
<th>Parameters</th>
<th>(Mean±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferritin</td>
<td>382.4±191.4</td>
</tr>
<tr>
<td>LDH</td>
<td>531.2±146.3</td>
</tr>
<tr>
<td>D-Dimer</td>
<td>610.07±543.4</td>
</tr>
<tr>
<td>CRP</td>
<td>97.24±50.1</td>
</tr>
</tbody>
</table>

Fig. 1. Modern prognostic tools in COVID-19 patients

Fig. 2. Siddha prognostic tools in COVID-19 patients
Table 4. Prognosis chart in COVID-19 patients

<table>
<thead>
<tr>
<th>Prognostic tools</th>
<th>Parameters</th>
<th>During the treatment</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
<th>Dis. Day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
<td>N (%)</td>
<td>N (%)</td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
<tr>
<td>Symptoms</td>
<td>Cough</td>
<td></td>
<td>70%</td>
<td>60%</td>
<td>30%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>Anorexia</td>
<td></td>
<td>30%</td>
<td>30%</td>
<td>10%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Dyspnea</td>
<td></td>
<td>50%</td>
<td>40%</td>
<td>10%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Malaise</td>
<td></td>
<td>70%</td>
<td>50%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Fever</td>
<td></td>
<td>40%</td>
<td>30%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Diarrhea</td>
<td></td>
<td>20%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Vomiting</td>
<td></td>
<td>10%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Headache</td>
<td></td>
<td>20%</td>
<td>20%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Neerkuri</td>
<td>Niram (Color)</td>
<td>Yellow</td>
<td>60%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>40%</td>
<td>70%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red</td>
<td>20%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>20%</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>White</td>
<td>20%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>40%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>Nurai (Froth)</td>
<td>Present (+)</td>
<td>40%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Absent (-)</td>
<td>60%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>50%</td>
<td>70%</td>
</tr>
<tr>
<td></td>
<td>Enjal (Volume/Time)</td>
<td>Deficiency</td>
<td>80%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>50%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency</td>
<td>20%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>50%</td>
<td>90%</td>
</tr>
<tr>
<td></td>
<td>Satthu (Sedimentation)</td>
<td>Present (+)</td>
<td>50%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>20%</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Absent (-)</td>
<td>50%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>80%</td>
<td>70%</td>
</tr>
<tr>
<td>Neikuri</td>
<td>Kanthuru (Bellerica fruit) - Kabhavatham</td>
<td>20%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Salladaikkan (Sieve filter) - Severe Kabham</td>
<td>20%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aravil Mutthu (Snake and Pearl) - Vathakabham</td>
<td>10%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pathimoozhibiya (Half sunken) - Sannivatham</td>
<td>10%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mutthil Aravu (Pearl and Snake) - Kabhavatham</td>
<td>10%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Methuvatta paraval (Slow spread circle) - Kabhapittham</td>
<td>10%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kalappu (Mingling) - Alarming sign</td>
<td>10%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moozhgiya nilai (Sunken) in red urine - Sannivatham</td>
<td>10%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mutthu (Pearl) - Kabham</td>
<td>0%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>70%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aravu (Snake) - Vatham</td>
<td>0%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sangu (Conch shell) - Good prognosis in Kabham</td>
<td>0%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>10%</td>
<td></td>
</tr>
</tbody>
</table>

[Dis. Day: Discharge Day, N: Number of cases, -: Test interval Timing]
6. DISCUSSION

6.1 Strengths

- It had been observed earlier by neerkuri-neikuri test earlier that the patient’s condition had not worsened and had given a confidence to continue the same Siddha treatment.
- The favourable changes observed in the neerkuri-neikuri test had given a good hope although the delay in the test results of the modern covid markers.
- The test was cost-effective and the results were immediately known by the clinician.

6.2 Interpretation

The mean age of the study population is 57.5±10 years. At the time of admission, 70% of patients had a cough, 70% of patients had malaise, 50% of patients had dyspnea, 30% patients had anorexia, 40% patients had a fever, 20% patients had diarrhea, 20% of patients had a headache and 10% patients had vomiting. At the time of discharge, only 10% of patients had a cough and all other symptoms were completely cured.

When compared with modern prognostic tools LDH, CRP, D-Dimer and Ferritin, the patients had a positive prognosis and showed significant changes in the results before and after administration of Siddha medication as shown in Fig. 1. Among 10 cases of neerkuri 60% had yellow, 20% had red and 20% had white color urine, meanwhile 70% had yellow, 20% had red and 10% had white at the time of discharge. The color of urine had no significant changes but red color urine was present in two cases, meanwhile nurai (froth), satthu (sedimentation) and enjal (frequency) showed significant changes and assured the disparity of urine from severe kabha and sanni state to other non-kabha or good prognosis state. 40% had frothy urine during admission and it had reduced into 30% during discharge. Sediments were present in 50%, it decreased into 30% on discharge day. Parallely, there was a very good improvement from neikuri patterns before and after the administration of the Siddha treatment, in which 70% patients turned into kabham (single humor dominant), 20% turned into vatham (single humor dominant) and 10% turned into good prognosis state. It showed the reduction of kabham and sanni characteristics of urine at the time of discharge after Siddha treatment.

According to Siddha pathophysiology [4,11], at the time of admission all the patients (100%) had kabham dominant or mingle with other humor or found with alarming-signs of neikuri patterns like Kanthuru (nape of the neck or Bellerica fruit), Salladaikkkan (sieve-filter), Aravilmuthu (snake and pearl), Pathimoozhhiyanilai (half-sunken), Mutthil aravu (pearl and snake), Methuvattaparaval (slow-spread and circle), Kalappu (mingling) and Moozhgiyanilai (sunken) in red-urine. Dealing with Siddha philosophy nurai (froth), satthu (sedimentation) and enjal (volume/times) had significantly changed and could be interpreted that the existing severe kabha and sanni conditions had changed into kabha or non-kabha or other state of good-prognosis, whereas at the time of discharge almost 90% of patients had either kabham or vatham [12].

7. CONCLUSION

Among COVID-19 cases neerkur-neikuri thervu (the urine-based Siddha diagnosis), played a positive role to confirm the diagnosis and assess the good prognosis of the disease till the modern test results awaited. Siddha interventions include diagnosis, treatment, prognosis and different types of medications. Siddha intervention neerkur-neikuri helped to assess the good prognosis earlier and would be a part of supporting diagnostic tool in future. The study enumerated the cost-effective Siddha diagnostic intervention neerkuri-neikuri among the COVID patients to precede the treatment successfully. From the above finding, it has been evident that Siddha urine analysis played a major role in ruling out the prognosis of the chronic disease condition also being cost-effective and more reliable for the clinicians until the modern scientific results received.

8. LIMITATIONS

- Because this is a case series with small sample size, justification from studies with a larger sample size is required before we can design a defined diagnostic tool Siddha neerkuri-neikuri for COVID-19 diagnosis and efficacy treatment.
- The handling of a urine sample of the Covid patient under proper ventilation, sunlight, sterile area, disposal of the sample, collection and testing time of the sample were not followed appropriately.

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AVAILABILITY OF DATA AND MATERIALS

Full de-identified data of the analyses are available upon request to the corresponding author.

ETHICAL APPROVAL

The authors certify that this trial has received ethical approval from Institutional Ethics Committee (IEC), Kokila Siddha Hospital and Research Centre, Madurai (IEC-03/2020 KSHRC). This case series is registered in the Clinical Trial Registry of India CTRI/2021/06/034103.

CONSENT

The authors state that informed consent was taken from all the patients for this study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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