## EDITORIAL

2686 Antifungal pipeline: Is there light at the end of the tunnel?  
*Schinas G*, *Spernovasilis N*, *Akinosoglou K*

2692 Cracking the silent gallstone code: Wait or operate?  
*Goswami AG*, *Basu S*

2698 Metabolic dynamics in chronic gastritis: Examining urinary profiles post *Helicobacter pylori* eradication  
*Musharaf I*, *Nashwan AJ*

2701 Pearls of meta-analyses and systematic review in scientific evidence  
*Au SCL*

## MINIREVIEWS

2704 Advanced nanomedicines and immunotherapeutics to treat respiratory diseases especially COVID-19 induced thrombosis  
*Wu J*, *Zheng Y*, *Zhang LN*, *Gu CL*, *Chen WL*, *Chang MQ*

## ORIGINAL ARTICLE

### Retrospective Cohort Study

2713 Clinical efficacy of intradermal type I collagen injections in treating skin photoaging in patients from high-altitude areas  
*Yang B*, *He A*, *Bu BB*, *Zhao G*, *Zhou QZ*, *He JH*, *Liu L*, *Huang WL*, *Zhao X*

### Retrospective Study

2722 Multimodal imaging in the diagnosis of bone giant cell tumors: A retrospective study  
*Kou MQ*, *Xu BQ*, *Liu HT*

2729 Treatment for paraganglioma with stereotactic radiotherapy  
*Pontoriero A*, *Critelli P*, *Zappieri M*, *Angileri FF*, *Ius T*

2738 Effect of endoscopic full-thickness resection assisted by distal serosal turnover with floss traction for gastric submucosal masses  
*Liu TW*, *Lin XF*, *Wen ST*, *Xu JY*, *Fu ZL*, *Qin SM*

2745 Relationship between ultrasound parameters of the umbilical and middle cerebral arteries and intrauterine fetal distress  
*Chen J*, *Liu FX*, *Tao RX*
## Contents

**Thrice Monthly Volume 12 Number 16 June 6, 2024**

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>2751</td>
<td>Effect of psychological nursing interventions on effectiveness and quality of life in schizophrenia patients receiving modified electroconvulsive therapy</td>
<td>Lu J</td>
</tr>
<tr>
<td>2758</td>
<td>Effect of percutaneous electrical stimulation at the Baliao point on preventing postpartum urinary retention after labor analgesia</td>
<td>Wang XQ, Guan LS</td>
</tr>
<tr>
<td></td>
<td><strong>Observational Study</strong></td>
<td></td>
</tr>
<tr>
<td>2765</td>
<td>Perceptions and factors influencing exercise interventions in elderly patients with debilitating spinal surgery and healthcare professionals: A qualitative study</td>
<td>Cheng RR, Li R</td>
</tr>
<tr>
<td></td>
<td><strong>Prospective Study</strong></td>
<td></td>
</tr>
<tr>
<td>2773</td>
<td>Helicobacter pylori: High dose amoxicillin does not improve primary or secondary eradication rates in an Irish cohort</td>
<td>Costigan C, O'Sullivan AM, O'Connell J, Sengupta S, Butler T, Molloy S, O'Hara FJ, Ryan B, Breslin N, O'Donnell S, O'Connor A, Smith S, McNamara D</td>
</tr>
<tr>
<td></td>
<td><strong>Clinical and Translational Research</strong></td>
<td></td>
</tr>
<tr>
<td>2789</td>
<td>Causal association between 25-hydroxyvitamin D status and cataract development: A two-sample Mendelian randomization study</td>
<td>Wang CH, Xin ZK</td>
</tr>
<tr>
<td></td>
<td><strong>SYSTEMATIC REVIEWS</strong></td>
<td></td>
</tr>
<tr>
<td>2796</td>
<td>Fat management in upper blepharoplasty: Addition or subtraction blepharoplasties, how and when</td>
<td>Miotti G, Di Filippo J, Grando M, Salati C, Parodi PC, Spadea L, Gagliano C, Musa M, Zeppieri M</td>
</tr>
<tr>
<td></td>
<td><strong>META-ANALYSIS</strong></td>
<td></td>
</tr>
<tr>
<td>2803</td>
<td>Iron and ferritin effects on intensive care unit mortality: A meta-analysis</td>
<td>Yang DC, Zheng BJ, Li J, Yu Y</td>
</tr>
<tr>
<td></td>
<td><strong>CASE REPORT</strong></td>
<td></td>
</tr>
<tr>
<td>2813</td>
<td>Secondary diabetes due to different etiologies: Four case reports</td>
<td>Song WR, Xu XH, Li J, Yu J, Li YX</td>
</tr>
<tr>
<td>2822</td>
<td>Giant cavernous aneurysms occluded by aneurysmal thrombosis, calcification, parent artery occlusion: A case report and review of literature</td>
<td>Wang MX, Nie QB</td>
</tr>
</tbody>
</table>
Contents

2831  Computed tomography three-dimensional reconstruction in the diagnosis of bleeding small intestinal polyps: A case report  
Zhang SH, Fan MW, Chen Y, Hu YB, Liu CX

2837  Managing adult-onset Still's disease in pregnancy: A case report  
Kang JH

2842  Eruptive xanthomas in a patient with severe hypertriglyceridemia: A case report  
Ren C, Zhu L, Niu YC, Tu LY, Jin ZF, Zhang J

2847  Conversion therapy of a giant hepatocellular carcinoma with portal vein thrombus and inferior vena cava thrombus: A case report and review of literature  
Song WJ, Xu J, Nie Y, Li WM, Li JP, Yang L, Wei MQ, Tao KS

2856  Migration of varicocele coil leading to ureteral obstruction and hydronephrosis: A case report  
Alamri A

2862  Endoscopic ultrasound features of rectal melanoma: A case report and review of literature  
Xiong ZE, Wei XX, Wang L, Xia C, Li ZY, Long C, Peng B, Wang T

2869  Giant vascular malformations invading the skull: A case report  
Xie MC, Wang FX, Xu J

2876  Uterine epithelioid trophoblastic tumor with the main manifestation of increased human chorionic gonadotropin: A case report  
Huang LN, Deng X, Xu J

2881  Dynamically changing antineutrophil cytoplasmic antibodies in granulomatosis with polyangiitis: A case report  
Zhang Y, Dai QD, Wang JA, Xu LP, Chen Q, Jin YZ

2887  Clinicopathological analysis of EWSR1/FUS::NFATC2 rearranged sarcoma in the left forearm: A case report  
Hu QL, Zeng C

2894  Thoracic giant cell tumor after two total en bloc spondylectomies including one emergency surgery: A case report  
Liang HF, Xu H, Zhan MN, Xiao J, Li J, Fei QM

2904  Primary thoracolumbar intraspinal malignant melanoma: A case report  
Huang JB, Xue HJ, Zhu BY, Lei Y, Pan L

2911  Liver abscess and tracheal fistula induced by transcatheter arterial chemoembolization for hepatocellular carcinoma: A case report  
ABOUT COVER
Peer Reviewer of *World Journal of Clinical Cases*, Shyam Sundar Das Mohapatra, DNB, MBBS, Surgeon, Department of Comprehensive and Community Ophthalmology, Sri Sankaradeva Nethralaya, Guwahati 781028, Assam, India. drssdasmohapatra@gmail.com

AIMS AND SCOPE
The primary aim of *World Journal of Clinical Cases* (*WJCC, World J Clin Cases*) is to provide scholars and readers from various fields of clinical medicine with a platform to publish high-quality clinical research articles and communicate their research findings online.

*WJCC* mainly publishes articles reporting research results and findings obtained in the field of clinical medicine and covering a wide range of topics, including case control studies, retrospective cohort studies, retrospective studies, clinical trials studies, observational studies, prospective studies, randomized controlled trials, randomized clinical trials, systematic reviews, meta-analysis, and case reports.

INDEXING/ABSTRACTING
The *WJCC* is now abstracted and indexed in Science Citation Index Expanded (SCIE, also known as SciSearch®), Journal Citation Reports/Science Edition, Current Contents®/Clinical Medicine, PubMed, PubMed Central, Reference Citation Analysis, China Science and Technology Journal Database, and Superstar Journals Database. The 2023 Edition of Journal Citation Reports® cites the 2022 impact factor (IF) for *WJCC* as 1.1; IF without journal self cites: 1.1; 5-year IF: 1.3; Journal Citation Indicator: 0.26; Ranking: 133 among 167 journals in medicine, general and internal; and Quartile category: Q4.

RESPONSIBLE EDITORS FOR THIS ISSUE
Production Editor: Si Zhao; Production Department Director: Xue Guo; Cover Editor: Jin-Lai Wang.
Retrospective Study

Relationship between ultrasound parameters of the umbilical and middle cerebral arteries and intrauterine fetal distress

Ji Chen, Fei-Xue Liu, Rui-Xue Tao

Abstract

BACKGROUND

By comprehensively analyzing the blood flow parameters of the umbilical and middle cerebral arteries, doctors can more accurately identify fetal intrauterine distress, as well as assess its severity, so that timely interventions can be implemented to safeguard the health and safety of the fetus.

AIM

To identify the relationship between ultrasound parameters of the umbilical and middle cerebral arteries and intrauterine distress.

METHODS

Clinical data of pregnant women admitted between January 2021 and January 2023 were collected and divided into the observation and control groups (n = 50 each), according to the presence or absence of intrauterine distress. The ultrasound hemodynamic parameters of the uterine artery (UtA), fetal middle cerebral artery (MCA), and umbilical artery (UmA) were compared with neonatal outcomes and occurrence of intrauterine distress in the two groups.

RESULTS

Comparison of ultrasonic hemodynamic parameters, resistance index (RI), pulsatility index (PI), and systolic maximal blood flow velocity of UmA compared to diastolic blood flow velocity (S/D), revealed higher values of fetal MCA, PI, and S/D of UmA in pregnant women with UtA compared to controls (P < 0.05), while there was no difference between the two groups in terms of RI (P > 0.05). The incidence of a neonatal Apgar score of 8-10 points was lower in the observation group (66.7%) than in the control group (90.0%), and neonatal weight (2675.5 ± 27.6 g) was lower than in the control group (3117.5 ± 31.2 g). Further,
cesarean section rate was higher in the observation group (70.0%) than in the control group (11.7%), and preterm labor rate was higher in the observation group (40.0%) than in the control group (10.0%). The incidence of fetal distress, neonatal growth restriction and neonatal asphyxia were also higher in the observation group (all \( P < 0.05 \)).

**CONCLUSION**

Fetal MCA, UmA, and maternal UtA hemodynamic abnormalities all develop in pregnant women with intrauterine distress during late pregnancy, which suggests that clinical attention should be paid to them, and monitoring should be strengthened to provide guidance for clinical intervention.

**Key Words:** Late pregnancy; Fetal intrauterine distress; Ultrasound blood flow parameters; Uterine artery; Middle cerebral artery; Umbilical artery

©The Author(s) 2024. Published by Baishideng Publishing Group Inc. All rights reserved.

**Core Tip:** Monitoring these ultrasound parameters is particularly important in high-risk pregnancies such as umbilical cord bypass, fetal growth restriction, or multiple pregnancies.

**Citation:** Chen J, Liu FX, Tao RX. Relationship between ultrasound parameters of the umbilical and middle cerebral arteries and intrauterine fetal distress. *World J Clin Cases* 2024; 12(16): 2745-2750
**URL:** https://www.wjgnet.com/2307-8960/full/v12/i16/2745.htm
**DOI:** https://dx.doi.org/10.12998/wjcc.v12.i16.2745

**INTRODUCTION**

Fetal intrauterine distress is a condition in which the fetus has an insufficient supply of oxygen and nutrients, thus affecting its normal growth, development, and safety; this condition can be caused by a variety of reasons[1]. It most commonly develops when the transfer of oxygen and nutrients from mother to fetus is affected by placenta previa, abruption, and insufficiency. Second, problems such as umbilical cord entanglement, prolapse, and obstruction of umbilical cord blood flow severely limit the blood supply to the fetus. Third, if the mother suffers from severe hypertension, diabetes mellitus, renal disease, cardiovascular disease, or infection, the oxygen and nutritional supply from the mother to the fetus may be affected. In addition, if the fetus has genetic disorders, congenital heart disease, intrauterine infection, or fetal hydrops, it may lead to an increased demand for oxygen or a less efficient utilization of oxygen by the fetus. Intrauterine distress is often accompanied by abnormal changes in the fetal heart rate, abnormal amniotic fluid, decreased fetal activity, and changes in biochemical indicators, such as fetal acidosis. Fetal heart monitoring, ultrasonography, and biochemical indicator tests are commonly used to diagnose this disease[2].

Once fetal intrauterine distress is detected, immediate measures should be taken to improve the fetal blood and oxygen supply, such as changing the position of the pregnant woman, administering oxygen and fluids, and administering contraction inhibitors. For severe intrauterine distress, early delivery may need to be considered to ensure the safety of mother and baby[3]. Regular prenatal checkups are performed to control maternal diseases and to avoid risk factors that may lead to fetal intrauterine distress. Ultrasound blood flow parameters of the umbilical and middle cerebral arteries are important tools for assessing fetal intrauterine distress. By monitoring changes in these parameters, physicians can more accurately determine the health status of the fetus and formulate appropriate treatment strategies accordingly. However, these parameters should be interpreted in conjunction with the clinical presentation and other test results, as blood flow parameters alone do not fully determine fetal health. Intrauterine fetal distress is a serious pregnancy complication that requires close monitoring and management by physicians and pregnant women to ensure both fetal health and safety. Early detection of intrauterine fetal hypoxia and reasonable interventions are important. In this study, the middle cerebral, umbilical, and uterine artery (UtA) parameters and fetal intrauterine distress are discussed.

**MATERIALS AND METHODS**

**General information**

Pregnant women with intrauterine distress admitted to our hospital between January 2021 and January 2023 were included in the observation group, while normal pregnant women were enrolled as the control group. The inclusion criteria were as follows: Observation group, abnormal fetal heart rate and clear signs of intrauterine distress; control group, no abnormal fetal heart rate and no signs of hypoxia. The exclusion criteria were a history of smoking and alcohol consumption during pregnancy, complications during pregnancy, hereditary diseases, breech or transverse fetal position, and abnormal placenta or fetal malformations. This study was approved by the Ethics Committee of our institute.
**Inspection methods**

Ultrasoundography was performed with a probe frequency of 2.5-5.0 MHz, and color Doppler ultrasound was used to measure hemodynamics after verification of gestational age. The following hemodynamic parameters were examined: Resistance index (RI), pulsatility index (PI), and systolic maximal flow velocity of the umbilical artery (UmA) compared to diastolic flow velocity (S/D) in a sampling volume of 2 mm and a vascular angle of 60°. Three complete, clear, continuous, and stable spectral images of the blood flow were obtained, and the parameters were measured and recorded. The examination was divided into three steps. The first was performed at the beginning of the middle cerebral artery (MCA) and was repeated three times to obtain the highest peak value. The second was performed at the free section of the umbilical cord and the UmA near the entrance of the umbilical cord to the placenta. The third was performed at the vertical branch of the iliac vessels facing the UtA to measure blood flow parameters.

**Observed indicators**

PI, RI, and S/D values of each blood flow parameter of the maternal UtA and fetal MCA and UmA; neonatal birth Apgar score; and pregnancy outcome.

**Statistical analysis**

All data were included using SPSS 21.0 statistics. Variables conforming to normal distribution are expressed as (mean ± SD), categorical variables as (%), and comparisons between groups were performed using the t or χ² tests. P < 0.05 was considered statistically different.

**RESULTS**

**Basic information**

There were 50 cases in the control group [age 29.1 ± 3.3 (24-40) years, gestational period 38.4 ± 1.8 (32-41) wk]. The observation group comprised a further 50 cases [age 28.9 ± 3.3 (24-40 years), gestational period 38.4 ± 1.4 36-42 wk]. There was no significant difference between the two groups (P > 0.05).

**Comparison of blood flow parameters**

All hemodynamic parameters of pregnant women's UtA were higher in the observation group than in the control group (P < 0.05); PI and S/D of the fetal MCA were lower in the observation group than in the control group; those of UmA were higher than in the control group (both P < 0.05), and there was no difference in the RI values between the two groups (P > 0.05; Table 1).

**Table 1 Comparison of uterine artery, middle cerebral artery, and umbilical artery-related blood flow parameters between the two groups, mean ± SD**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number</th>
<th>UtA</th>
<th>MCA</th>
<th>UmA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>RI</td>
<td>PI</td>
<td>S/D</td>
</tr>
<tr>
<td>Observation group</td>
<td>50</td>
<td>0.62 ± 0.14</td>
<td>1.78 ± 0.26</td>
<td>3.04 ± 0.44</td>
</tr>
<tr>
<td>Control subjects</td>
<td>50</td>
<td>0.49 ± 0.08</td>
<td>1.42 ± 0.03</td>
<td>2.29 ± 0.41</td>
</tr>
<tr>
<td>P value</td>
<td></td>
<td>0.001</td>
<td>0.002</td>
<td>0.001</td>
</tr>
</tbody>
</table>

UtA: Uterine artery; MCA: Middle cerebral artery; UmA: Umbilical artery; RI: Resistance index; PI: Pulsatility index; S/D: Systolic maximal flow velocity of the umbilical artery compared to diastolic flow velocity.

**Logistic regression correlation analysis of fetal UtA and MCA ultrasound blood flow parameters of umbilical cord bypass and fetal intrauterine distress**

Logistic regression analysis revealed a significant correlation between PI, RI, and S/D of the UmA and MCA in umbilical cord-wrapped fetuses and intrauterine distress (P < 0.05; Table 2).

**Neonatal situation**

The neonatal weight was found to be lower in the observation group (2675.5 ± 27.6 g) than in the control group (3117.5 ± 31.2 g) (t = 14.354, P = 0.002); neonatal score of 8-10 points was 40 cases, while in the control group there were 2 cases of ≤ 3 points, 4 cases of 4-7 points, and 54 cases of 8-10 points, and the proportion of patients with a score of 8-10 points in the observation group (66.7%) was lower than that of the control group (90.0%) (both P < 0.05).
combined with other monitoring methods to evaluate the risk of fetal distress in order to improve the diagnostic accuracy. At present, the normal range and abnormal standard of relevant blood flow parameters have not been unified in the world, which increases the difficulty of clinical interpretation. Therefore, in clinical practice, it is often difficult to accurately determine. A single test is limited. First of all, the technology has high requirements for operator experience and equipment quality, and the measurement results are easily affected by subjective factors and image quality. Secondly, fetal hemodynamic parameters will change dynamically with factors such as fetal status, maternal health status, and examination time. A single test is difficult to fully reflect the entire pregnancy. Furthermore, abnormal blood flow parameters are not directly equated with fetal distress, and false positive and false negative results may occur. In addition, different blood flow parameters are interrelated and have different responses under pathological conditions, which need comprehensive analysis to accurately determine. At present, the normal range and abnormal standard of relevant blood flow parameters have not been unified in the world, which increases the difficulty of clinical interpretation. Therefore, in clinical practice, it is often combined with other monitoring methods to evaluate the risk of fetal distress in order to improve the diagnostic accuracy.

### Table 2 Logistic regression correlation analysis of fetal umbilical artery and middle cerebral artery ultrasound blood flow parameters with intrauterine distress in umbilical cord bypass fetuses

<table>
<thead>
<tr>
<th>Observation indicators</th>
<th>Wald</th>
<th>P value</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>UmA PI</td>
<td>8.837</td>
<td>0.004</td>
<td>3.248</td>
<td>1.448-12.308</td>
</tr>
<tr>
<td>RI</td>
<td>5.341</td>
<td>0.026</td>
<td>2.156</td>
<td>1.243-8.263</td>
</tr>
<tr>
<td>S/D</td>
<td>8.338</td>
<td>0.037</td>
<td>3.146</td>
<td>1.476-14.597</td>
</tr>
<tr>
<td>MCA PI</td>
<td>7.514</td>
<td>0.005</td>
<td>2.574</td>
<td>1.145-9.415</td>
</tr>
<tr>
<td>RI</td>
<td>10.241</td>
<td>0.000</td>
<td>2.983</td>
<td>1.341-11.374</td>
</tr>
<tr>
<td>S/D</td>
<td>10.719</td>
<td>0.000</td>
<td>3.217</td>
<td>1.517-12.372</td>
</tr>
</tbody>
</table>

MCA: Middle cerebral artery; UmA: Umbilical artery; PI: Pulsatility index; RI: Resistance index; S/D: Systolic maximal flow velocity of the umbilical artery compared to diastolic flow velocity.

Cesarean section was more common in the observation group (42 cases, 70.0%) than in the control group (7 cases, 11.7%), while the rates of preterm delivery was also higher in the observation group (24 cases, 40.0%) than in the control group (6 cases, 10.0%); the incidence of fetal distress (12 cases, 20.0%), neonatal growth restriction (24 cases, 40.0%), and neonatal asphyxia (4 cases, 6.7%) was higher in the observation group than in the control group [(2 cases, 3.3%) (all \( P < 0.05 \)) (4 cases, 6.7%) (all \( P < 0.05 \))].

### DISCUSSION

Fetal intrauterine distress in late pregnancy is primarily caused by three reasons: First, the poor development of the fetus itself; second, a decline in the oxygen content of the pregnant woman's own blood; and third, poor transportation or exchange of blood oxygen between the mother and baby. Once intrauterine distress occurs, it directly affects the growth and development of the fetus, and further affects the intellectual and nervous systems[4,5]. Fetal movement counting and fetal heart rate monitoring have different degrees of limitations and low diagnostic value, whereas ultrasonography has become a major means of prenatal examination because of its good economy, reproducibility, and non-invasiveness[6,7]. In late pregnancy, hypoxia is determined by blood flow parameters related to the fetal MCA, that is, S/D is less than 4, PI is less than 1.6, and RI is less than 1.6. It should be emphasized that there is a bidirectionality of RI; it decreases in the hypoxic compensatory state and remains normal, or increases in the hypoxic decompensatory state. A significant increase in middle cerebral artery peak velocity can be considered as an indicator of anemia[8-10]. In fetal hypoxia, end-diastolic blood flow was first affected and then decreased, while PI, RI, and S/D values increased. When the diastolic waveform was inverted or absent, the hypoxic condition was considered to be severe[11,12]. A series of MCA, UmA, and UtA parameters detected using two-dimensional ultrasound and ultrasound Doppler allow a clear diagnosis of intrauterine fetal hypoxia and anemia.

In the present study, the incidence of intrauterine distress was found to be increased in the presence of abnormal changes in the UtA, UmA, and MCA, which was further confirmed by examination the neonatal score and pregnancy outcomes. As the main source of fetal blood supply, the alteration of blood flow in the UtA has a direct impact on growth and development[13], while the UmA effectively reflects the state of placental-fetal blood circulation, which is greatly increased in the presence of intrauterine distress[14]. This can provide a clinical reference and make prevention of intrauterine distress more targeted. In the present study, logistic regression analysis revealed a significant correlation between the PI, RI, and S/D of the UA and MCA and fetal intrauterine distress (\( P < 0.05 \)), indicating that fetal UA and MCA blood flow parameters could be detected by ultrasound and objectively used to judge and predict fetal intrauterine distress.

Ultrasound parameters of UmA and MCA are important tools for evaluating fetal distress, but there are still significant limitations. First of all, the technology has high requirements for operator experience and equipment quality, and the measurement results are easily affected by subjective factors and image quality. Secondly, fetal hemodynamic parameters will change dynamically with factors such as fetal status, maternal health status, and examination time. A single test is difficult to fully reflect the entire pregnancy. Furthermore, abnormal blood flow parameters are not directly equated with fetal distress, and false positive and false negative results may occur. In addition, different blood flow parameters are interrelated and have different responses under pathological conditions, which need comprehensive analysis to accurately determine. At present, the normal range and abnormal standard of relevant blood flow parameters have not been unified in the world, which increases the difficulty of clinical interpretation. Therefore, in clinical practice, it is often combined with other monitoring methods to evaluate the risk of fetal distress in order to improve the diagnostic accuracy.
CONCLUSIONS

In conclusion, the ultrasound blood flow parameters (RI, PI, S/D) of the UtA and MCA were higher in umbilical cord-bypassed fetuses than in non-umbilical cord-bypassed fetuses and were more prominent in late pregnancy. The RI, PI, and S/D of the UA and MCA were highly correlated with intrauterine distress.

FOOTNOTES

Author contributions: Chen J and Liu FX contributed equally to this work; Chen J, Liu XF and Tao RX designed the research study, analyzed the data and wrote the manuscript; performed the research; Chen J and Tao RX analyzed the data and wrote the manuscript. All authors have read and approved the final manuscript.

Institutional review board statement: This study was reviewed and approved by the Institutional Review Committee of The Third Affiliated Hospital of Anhui Medical University.

Informed consent statement: All study participants or their legal guardian provided informed written consent about personal and medical data collection prior to study enrolment.

Conflict-of-interest statement: The authors declare no conflicts of interest for this article.

Data sharing statement: No additional data are available.

Open-Access: This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: https://creativecommons.org/Licenses/by-nc/4.0/

Country/Territory of origin: China

ORCID number: Ji Zhao 0000-0005-6586-5819; Rui-Xue Tao 0000-0007-4885-7387.

S-Editor: Liu H
L-Editor: A
P-Editor: Zhao S

REFERENCES

